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RANGE CONSERVATION THE EXCEPTION

AND

THE ADMINISTRATION OF PUBLIC RANGE LANDS

FROM

THE WESTERN RANGE—A GREAT
BUT NEGLECTED NATURAL RESOURCE

FOREST SERVICE

U. S. DEPARTMENT OF AGRICULTURE



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RANGE CONSERVATION THE EXCEPTION

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The western range picture is not entirely unfavorable. There are areas on which action has been taken or is in course of being taken, to stop depletion, improve existing conditions, and stabilize the use of the range. In the national forests is found the greatest single attempt to turn back the tide of depletion and to undertake planned use of the resources. Progress is being made on the Indian reservations. Action has been started in the grazing districts on 66 million acres of what until recently was open public domain. Here and there in the West are found privately owned range lands which have been carefully utilized and the forage resources wisely conserved. These instances of deliberate management are guideposts pointing the way toward a sounder range livestock agriculture.

THE NATIONAL FORESTS

Of the present area of approximately 133,875,000 acres of federally owned land in the national forests of the western range States, about 82,538,000 acres, or 62 percent, of the total is used for grazing of domestic livestock. Upon these lands approximately 1,400,000 cattle, 30,000 horses, and 6,152,000 sheep and 9,000 goats are grazed regularly during several months of each year.³⁰ These permitted livestock, which represent 12 percent of all the cattle and 23 percent of all the sheep in the 11 western States, are owned by more than 25,000 farmers, settlers, and ranchers, most of whom reside in or near the forests.

The national forests represent the initial effort of the Federal Government to undertake on a major scale the management of land resources which it was in the general interest to retain in public ownership. Extensive areas of the range which was included had already been seriously depleted by the free-for-all use which had gone on for several decades prior to the establishment of an administrative agency. The situation in many respects was not unlike that on the open public domain today. The mad scramble for range and the competition between the large livestock operator who had preempted the open range and the home builder who was endeavoring to get a start was at the expense of the grazing resources and the orderly development of struggling new communities.

Although the guiding motive in the establishment of the national forests was the conservation of timber and the protection of water-

³⁰ Exclusive of calves under 6 months and of lambs. The average grazing season for cattle is 5.7 months, for horses 5.5 months, for sheep 3.3 months, and for goats 5.7 months.

sheds,³¹ conservation of the other resources was implied, and the forage crops produced on them have received equal consideration in protection, development, and use along with all other resources. The basic aim in the management of these lands has been to develop sustained yield and to make all of the resources contribute in the fullest degree, consistent with the broader public needs, to the sound social and economic development of the dependent population. On the whole, it was an attempt toward planned use of land and a challenge to the laissez-faire doctrine in land occupation and use in the United States.

Today, after 30 years of administration under the Department of Agriculture, not all of the national-forest ranges have been restored to their virgin capacity, but real progress has been made. Wholesale depletion has been checked and marked recovery is the rule. The national-forest ranges, on the whole, as shown in table 49, are in approximately 70 percent of virgin condition. This figure compares favorably with figures elsewhere presented—of 33 percent of virgin condition on the grazing districts and public domain and 49 percent on private range lands.

TABLE 49.—Degree of depletion of virgin range in plant types on the national forests

Plant type	Total area ¹	Moderate depletion (0-25 per-cent)	Material depletion (26-50 per-cent)	Severe depletion (51-75 per-cent)	Extreme depletion (76-100 per-cent)	Average depletion
	1,000 acres	Percent	Percent	Percent	Percent	Percent
Tall grass.....	202	100				12
Short grass.....	993	40	48	12		30
Pacific bunchgrass.....	1,714	29	46	25		37
Semidesert grass.....	1,636	3	49	29	19	53
Sagebrush-grass.....	3,637	11	68	20	1	40
Southern desert shrub.....	98		51	8	41	60
Salt-desert shrub.....	366	49	49	2		26
Piñon-juniper.....	13,811	25	41	30	4	41
Woodland-chaparral.....	712	2	70	28		44
Open forests.....	64,785	55	37	7	1	26
Total and average.....	87,954	46.5	40.0	12.0	1.5	30

¹ Includes acres of usable range closed to grazing for various purposes.

Earlier presentation of trends of depletion has shown that during the past 30 years the average trend has been one of improvement on 77 percent of the national forest range area and on only 5 percent has there been an appreciable decline. During the last 5 years, however, owing to drought and depression, the improvement trend has been offset by a slightly downward trend on 19 percent of the area. The net improvement may be summarized in one figure for the period from 1910 to 1934—forage production on the present usable range on the national forests has increased 19 percent.³²

³¹ For a discussion of the timber resources and watershed values in the national forests, see A National Plan for American Forestry (154), pp. 173, 298.

³² The number of livestock grazed on the national forests in terms of animal months of use was actually reduced about 7 percent between 1910 and 1934. However, during that same period a net area of approximately 10,000,000 acres, mostly grazing land, has been excluded from within the national forests. Approximately 2,250,000 acres, most of it the very best grazing land, has been alienated under the Forest Homestead Act of June 11, 1906. Grazing capacity amounting to an equivalent of approximately 2,000,000

The net social and economic benefits which have been derived from the policy of administration of the national forests, are more difficult to appraise in specific terms. Nevertheless the benefits have been positive and real. Almost as many livestock are grazed and as many dependent stock growers use the range now as a quarter of a century ago. Forage on national-forest range is more dependable than on any other class of land. Uses for other purposes than for grazing have greatly increased. National-forest ranges to a large degree have been correlated with other classes of agricultural land.

It is proposed to review briefly the circumstances and vital forces which led to the establishment of the national forests and the initial aims and objectives of administration; describe briefly the action taken to implement these aims and objectives and to appraise the net results and existing problems. Such an analysis of accomplishments in the initial experiment with Federal land management may be of significance in further developing a program for future action on all publicly owned range lands.

ESTABLISHMENT OF THE NATIONAL FORESTS

The initial approach to conservation of the range resources was an outgrowth of the concern over the depletion of forests and injury to watersheds. Alarm over forest destruction as a national problem was expressed as early as 1819 (77). There was, however, a long delay before any positive action was taken. In the meantime, legislation was directed principally toward disposal of land. The Secretary of the Interior vainly requested appropriations with which to enforce laws against illegal cutting of timber on the public domain. From 1878 to 1891 there was much debate in Congress over Government timberlands, but no action was taken until the passage of the act of March 3, 1891, which authorized setting apart forest reserves by Executive order out of parts of the public domain whether wholly or partly covered with timber. However, progress was slow for several years after the enactment of this statute and up to 1897, only 19 reservations had been set aside aggregating 18,933,280 acres in area.

Efforts were then somewhat stimulated following the report of an investigation the Secretary of the Interior had requested the National Academy of Sciences to make of publicly owned forest lands. Among other things he asked that investigations be made concerning the influence of forest upon climate, soil, and water conditions. The report of representatives of the Academy dated May 1,

acres of range is reserved for use by game on the total of over 100 State and Federal game preserves. The extension of tree growth on the 42,000,000 acres of grazed timber land has reduced grazing capacity in an amount equivalent to the withdrawal from grazing use of 4,000,000 acres of good grazing land. Approximately 4,000,000 acres of usable range land have been actually closed to grazing between 1910 and 1934, in the interest of watershed protection, game, recreational use, timber growth, and for other purposes. Thus the total range area available to livestock has been reduced the equivalent of 22 percent during the 25-year period. Since the land eliminated or taken out of use was slightly better than average in grazing capacity the area now being used, in order to take care of the present number of stock, has increased 19 percent in grazing capacity. This does not take into account the additional facts that there has been a very large increase in number of game animals outside the game preserves; that in 1910 there were only 75 lambs per hundred grown sheep grazed and now there are 95 lambs for each hundred grown sheep, that the number of calves under 6 months have increased proportionally; and that, due to improvement in breed and quality, the animals are larger and heavier and therefore each animal now consumes more feed than formerly.

1897, among other things recorded widespread and serious damage to ranges and watersheds by unrestricted grazing (91). By June 30, 1898, 30 reserves had been established including 40,719,474 acres. Progress continued to be slow, however, for some years, and meanwhile much timber, range, and watershed land which should have been retained in public ownership passed into private hands.

The fight for conservation took on real life in 1901 under the leadership of President Theodore Roosevelt and Gifford Pinchot. The issue was broadened into a fight for the protection of the interests of the people against monopoly as well as for the conservation of the resources. Big interests had shown their power to grab natural resources, to monopolize business, and to control politics.

The situation with respect to grazing livestock on the range helped to stimulate action. At the opening of the twentieth century livestock production in the West was typically a public-lands industry. It had grown great on free range. Severe competition for use of the range had developed between cattlemen and sheepmen and between them and the homesteader. Nomadic flocks and herds from distant wintering and breeding grounds increasingly swept the high ranges. The "tramp stockman" moved from one region to another, pressing in ahead of the local residents in a scramble to get the feed. The homemaker was ground between the upper and the nether millstones. The whole situation was precarious, chaotic, and in many ways economically unsound. Many of the more powerful stockmen sought ways to establish and perpetuate their monopoly of the range. It all tended to retard settlement and community development. To Roosevelt it was a question of a square deal and economic freedom for the people of the West.

The Roosevelt principles gored the monopolistic ox, and the opposition was expressed in pressure for eliminations of land from the forest reserves and finally in the withdrawal of authority for creating national forests by Executive order in most of the States. For obvious reasons the powerful interests wished to retain freedom from interference. Nevertheless, the fight against monopoly and exploitation and for the protection of public interest for the "greatest good to the greatest number in the long run" was partially successful. During the time Theodore Roosevelt was in the White House, 148 million acres were withdrawn for national forests, bringing the total area reserved up to 194.5 million acres. This placed most of the remaining public timberland and most of the more important watersheds of the West under Government control, and a positive system of administration was initiated. However, the plan for national ranges which Roosevelt had proposed in 1905 (111) failed to materialize.

Regulated use of the forest reserves was not authorized until the passage of the act of June 4, 1897. Under this law the first rules and regulations were written which provided that—

The pasturing of livestock on the public lands in forest reservations will not be interfered with, so long as it appears that injury is not being done to the forest growth, and the rights of others are not thereby jeopardized.

The grazing of sheep, however, was prohibited in all forest reservations, except in Oregon and Washington, where the "abundant rainfall of the Cascade and Pacific coast ranges make rapid renewal of herbage and undergrowth possible."

There was almost no development of conservation policies. The major function of the General Land Office of the Department of the Interior, which had most of the responsibility for the forest reserves, was the administration of the homestead and other land-disposal laws, a function hardly compatible with the development of a conservation policy or organization. The tenor of the manual of regulations of April 12, 1902, for example, was that of legality and minimum carrying out of the law. Officials of the Land Office in Washington had no first-hand knowledge of the reserves. Business was largely handled from Washington and great delays were encountered. The instructions to the public were that—

when the applicant fails to hear of his application in a reasonable time, say 30 days, he should address letters both to the Supervisor and to the Commissioner of the General Land Office, Washington, D. C.

Due to limited authority and divided responsibility, the mechanics of administration were seriously hampered by the resulting "red tape" which greatly annoyed the people of the West who needed to use the resources of the forest reserves.

Appointments to administrative positions on the forest reserves under the Department of the Interior were principally political. Not until December 17, 1904, through the efforts of the Society of American Foresters and other organizations, was the personnel placed under Civil Service. As would be expected under a system of political appointments with no sense of security in office, low salaries and little chance for promotion, well-qualified men were discouraged from seeking employment (77).

There was no technical forest or range-management organization except for a 3-year period beginning in 1901 when the Forestry Division of the Department of the Interior was created. Its purpose was to cooperate with the General Land Office in the administration of the forest reserves. Since such a plan of organization was not basically sound, hostility developed (28) and the entire technical force resigned in 1903. With the exception of this group the conservation thought was entirely within the Bureau of Forestry in the Department of Agriculture. There existed the anomalous situation of forest administration in a division of one department and of all the foresters in a bureau of another. President Roosevelt and the Secretary of the Interior urged Congress to transfer the administration of the forest reserves to the Bureau of Forestry in the Department of Agriculture and this was accomplished by the act of February 1, 1905. In 1907 the forest reserves were renamed the "national forests."

AIMS AND OBJECTIVES IN ADMINISTRATION

The broad aims and objectives in the administration of the national forests were laid down by Secretary of Agriculture James Wilson in a letter of February 1, 1905, to the Chief of the Forest Service in which he said:

You will see to it that the water, wood, and forage of the reserves are conserved and wisely used for the benefit of the home builder, first of all, upon whom depends the best permanent use of lands and resources alike. * * * All land is to be devoted to its most productive use for the permanent good of the whole people and not for the temporary benefit of individuals or companies.

All of the resources * * * are for use, and this use must be brought about in a thoroughly prompt and businesslike manner, under such restrictions only as will insure the permanence of these resources. The permanence of the resources * * * is therefore indispensable to continued prosperity. * * * The continued prosperity of the agricultural, lumbering, mining, and livestock interests is directly dependent upon a permanent and accessible supply of water, wood, and forage * * * (made available) under businesslike regulations enforced with promptness, effectiveness, and common sense.

Local questions will be decided upon local grounds; the dominant industry will be considered first, but with as little restriction to minor industries as may be possible.

Regarding this letter it has been said (28):

A careful perusal of the above is commended, not so much because of its terse common sense as because of its continuous existence to the present moment as the standing general orders under which the forest work of the country has gone and still goes forward.

The administration of the national forests provides for the following:

1. *Conservation and use*.—Perpetuation of all of the resources through wise use, protection, and development.

2. *Multiple use*.—Correlation in management and use of the different resources in order to obtain the highest net benefits from the combined resources of the land.

3. *Equal opportunity*.—Protection of the settler and home builder against monopoly and unfair competition in the use of resources.

4. *Integration with agriculture*.—Relating the use of range and other resources on the national forests to farm-grown forage crops, range, and other agricultural resources in a manner to obtain the highest benefits from the several classes of land.

5. *Stability of use*.—Safeguarding livestock agriculture by affording maximum stability in the use of the range resources, consistent with the objects of the national forests.

6. *Cooperation with users*.—Provision for livestock growers, other users, and local governments to have advisory voice in the administration of the national forests which they use.

7. *Local administration*.—A businesslike, decentralized, and technical administration designed and organized to settle local problems according to local conditions without delay.

The first regulations incorporating these basic policies were put into effect on July 1, 1905, except for an advisory voice, which came later. The regulations have been modified from time to time to meet new conditions, for clarification of purpose, and for better definition of their application.

MULTIPLE USE OF RESOURCES

The national forests contain a variety of resources or values, including timber, water, range forage, game, fishing, and recreation. Rarely is there an instance where two or more of these values are not associated on any given tract of land. Some one may be dominant but others are nearly always present in an amount sufficient to require consideration in land management. This association of resources injects the necessity for "multiple use" management—or management which will yield the highest social and economic benefit from all of the resources combined. Accomplishment of multiple use is one of the important objectives of national-forest land management. Obviously

its attainment involves due consideration for local and present-day needs, as well as long-range planning to meet the future requirements.

For example, 43 million acres, or approximately half of the national-forest range, is forest land, where commercial timber production will have to be the dominant use. The number of recreational visitors to the western national forests have increased steadily from more than 3 million in 1917 to over 38 million in 1934. The number of deer, elk, moose, mountain sheep, antelope, bear, and other big game animals on range lands in the national forests increased from 613,000 in 1914 to 1,084,000 in 1934; upland game birds and fur bearers also have increased during this period.

Ordinarily multiple use has been accompanied with only minor sacrifices in the use of any one resource. Exclusion of other uses is unnecessary and undesirable except where the highest public good can be attained in no other manner. Of the total usable area of 87,954,307 acres of range land in the national forests, only 1,410,928 acres, or 1.6 percent of the total usable acreage, has been closed to grazing for highly intensive recreational use; 2,829,441 acres, or 3.2 percent, has been closed for game ranges; 821,156 acres, or 0.9 percent, for watershed protection; 210,344 acres, or 0.2 percent, for protection of timber; and 144,329 acres, or 0.2 percent, for other purposes. The total excluded range amounts to only 6.1 percent of the total usable range area. On the remaining 93.9 percent of land the various uses, including grazing, are coordinated with each other.

One of the chief requirements in multiple-use management has been to foresee the needs and gradually adjust the various uses to meet them. Livestock seldom can be removed on short notice without sacrifice by the dependent user. However, sudden adjustments have rarely been necessary.

ADMINISTRATION OF RANGE USE

CONTACTS WITH THE USER

For prompt and efficient handling of business to promote the solution of local problems upon local grounds, the Forest Service is organized on a basis of decentralized authority. Forest officers are located among the people they serve in order to be constantly in touch with local conditions. The actual job of administration of the range and other resources rests in the forest supervisor and his rangers assigned to each of the 105 national forests in the Western States. The people in the local communities transact their business with either the forest ranger or the forest supervisor. Only remote users must deal by letter or by occasional contact. "Our ranger" is a term applied by many people in western communities in referring to the Forest Service official with whom they deal.

The character of administration and technical nature of the work emphasizes the need for a properly qualified personnel chosen and trained for the duties they have to perform. Practically all forest officers are "career men" who have chosen some line of forestry work as a life profession. Recruited through the civil service, candidates for examinations must show adequate training and experience in forest or range work. The education of the newly pledged forest officer is further advanced by training schools, study courses,

assignments under senior officers qualified to develop younger men, transfers from one type of job to another, and by experience on the job. Assignment to range management is dependent upon aptitude and special qualifications for the work.

Under national-forest policy, users are entitled to exercise freedom in the use of the national forests in accordance with the established rules and regulations, and to be heard on all matters affecting their own or the public welfare. Through the free exchange of ideas most problems are harmoniously settled on the ground.

In order further to facilitate dealing with various local problems, the organization of national-forest users into associations is officially recognized and encouraged. Advisory boards are elected by the association membership and these receive notice of proposed action and have an opportunity to be heard. Over 700 livestock associations have been organized by users of national-forest ranges and many of these local associations are affiliated with the State associations and these, in turn, with national associations which deal with the Forest Service on matters of State- and Nation-wide importance. Grazing boards, created upon the request of the majority of a group of national-forest users, receive suggestions and complaints regarding the administration of grazing, investigate all facts relating thereto, and assist, advise, and consult with forest officers on matters of general interest to the permittees.

Range users, however, are usually outnumbered by others interested in watershed protection, recreation, wildlife, timber, mineral development, and a variety of minor uses, upon which a substantial part of the support of many communities is dependent. The people so involved are as fully entitled to a voice in national-forest administration as are the stockgrowers. Recognition of these interests is also provided for in the national-forest regulations. Counsel and assistance are also invited from city, county, and State governments concerned either directly or indirectly with national-forest administration.

With so many interests involved it becomes the task of the Forest Service, as the public agency concerned, to harmonize conflicts and arbitrate differences between groups or individuals. The Forest Service also has the duty and the responsibility to protect the public interest whenever there is difference of opinion regarding established national-forest policy. Many of the latter cases arise out of the inclination of some users to disregard the requirements for range conservation in order to satisfy their immediate needs. In such instances the Forest Service proceeds on the basis of the best information available and, with due consideration of all the circumstances, adopts the procedure which will lead in the direction of the "greatest good to the greatest number in the long run."

It is the aim of the Forest Service always to settle locally all matters submitted for consideration. However, appeal may be taken successively from the decision of the forest ranger, forest supervisor, regional forester, and Chief of the Forest Service to the Secretary of Agriculture, with whom final regulatory authority rests.

CHARGES FOR GRAZING USE

The collection of a reasonable fee for the use of national-forest range is nothing more or less than the recognition of the common business principle of paying for values received. The intrinsic worth of the forage and the stability afforded the livestock agriculturist in the use of the range have definite values. Not to collect fees from the range users would result in a subsidy to this group as compared to the producer who operates on privately owned or leased range or farm land. The collection of fees is also justified as a means of offsetting the cost of administration and the construction of improvements on the range by the Government, both of which directly benefit the range user. Nevertheless, almost continuous pressure has been brought by the livestock interests using the range to keep the fees as low as possible.

Collection of fees was first provided for by the grazing regulations of July 1, 1906. The principle of competitive bidding was not adopted because it was early recognized that to do so would be disadvantageous to the small operator and lead to instability in agriculture. The minimum charge for summer grazing was first fixed at 5 to 8 cents per head for sheep and 20 to 35 cents for cattle and horses. The regulation prescribing these fees provided that as the conditions of the range improved and the demand for permits warranted it, the charge for grazing would be increased gradually in accordance with the advantages enjoyed by the permittees in the different localities. The last increase followed a detailed appraisal of national-forest ranges begun in 1921 to establish the fees on a parity with commercial rates.

In this appraisal the rates paid on similar leased lands and the cost of owning grazing land, all of which are determined more or less by natural economic forces, were used as a base. Adjustments in the base rates were made for factors affecting grazing value, such as type of forage, topography, weights and losses of livestock, and distance to market. The resultant charges proposed, therefore, varied with the factors inherent in the range. After strong opposition to the general increase by stockmen, the Secretary of Agriculture designated a stockman to review the appraisal who recommended the increase to commercial basis less 25 percent. The Secretary approved the recommendation and ruled that the increase in fees be applied 25 percent a year beginning in 1928 and become fully effective in 1931.

The extreme low prices of livestock in 1931, however, presented a new problem and fees were readjusted to vary from year to year in accordance with the market prices of livestock during the previous year. If the basis is correct the average fee paid over a long period should approximately equal the adjusted commercial rate. Under this readjustment the fees paid into the United States Treasury for grazing on the national forests amounted to an average of \$1,359,730 per annum during the 5-year period ending June 30, 1935. Twenty-five percent of the fees are paid to the States in which they are collected, for road and school purposes, and an additional 10 percent was spent for the construction of roads and trails in the national forests.

DEVELOPMENT AND APPLICATION OF RANGE MANAGEMENT

In order to maintain the basic resource and accomplish the highest degree of sustained use of range forage, the Forest Service applies the best known principles and practices of range management. To do so is in the interest of the stockman because it maintains the basic resource upon which livestock production is dependent. It substitutes the policy of stability in the long run for the former practice of exploitation of the resources for immediate gains.

Originally, the individual owner and the Forest Service started even in their attempts at range management—both had to depend on “rule-of-thumb.” Meager consideration had previously been given to range management in the United States or elsewhere. Little was known except in the most general way, for example, about the relative value for grazing of the various native range-plant species, their ability to withstand grazing, their requirements for growth and reproduction, the circumstances under which best to use them, the ability of the soil to produce them, and all the other factors which together determine grazing capacity, proper season of use, adaptability of the range to different classes of stock, requirements for sustaining the production of forage, how to maintain the stability and fertility of the soil, and how to maintain desirable conditions of stream flow. Basic knowledge of this character was essential to determine how best to use and maintain the range. It was apparent also that a higher sustained grazing capacity of the range could be attained if there could be developed and applied in a practicable and skillful way a better adjustment of grazing to the natural biological laws governing plant growth, securing a more even distribution of livestock, and a better utilization of the forage.

Various steps were taken to meet this need for a more scientific range management. The assistance and advice of experts in the other Bureaus of the Department of Agriculture were enlisted. Administrative officers of the Forest Service began to make investigations and to build on their experience. Stockmen were called upon freely for advice on practical phases. In 1911 range research was started in the Forest Service. Some of the agricultural colleges and universities, with encouragement from the Forest Service, modified or broadened curricula to provide training in related subjects and to offer courses and conduct research in range management. Thus over the years with aid of research by Federal and State agencies, educational institutions, and tried experience and systemization of methods in the Forest Service, a reasonably comprehensive science and practice of range management is in process of development for improving, maintaining, and utilizing the range resources. Most of the research work is now conducted by the 6 western regional forest and range experiment stations at 12 branch field stations situated in the more important range types both on and off the national forests, and includes studies both in range management and the influence of grazing on soil, timber growth, erosion, run-off, and stream flow. The results of this research have been widely applied on the national forests, and to some extent on other ranges, along the lines indicated in the following paragraphs.

RANGE CONDITIONS NOT LEFT TO GUESSWORK

So gradually may improvement or decline of the range take place that even persons in constant contact with the range are not able by ordinary observation to detect profound alterations. Obviously the sum total of changes over a period of years may be noted, but it may then be too late to repair damage without drastic action. Sample plots on the range actually mapped and recorded at regular intervals according to approved methods, serve as reliable checks less subject to error than human judgment and memory. More than 6,400 of these have been established and are being recorded regularly to detect range trends in western national-forest ranges. Approximately one-third of these are check plots fenced against grazing for use in estimating trends on grazed range. The actual records from these plots serve many useful purposes in settling problems to the satisfaction of both forest officers and livestock owners.

GRAZING CAPACITY

Keeping numbers of stock within the sustained grazing capacity of the range has been one of the most important as well as one of the most difficult undertakings in range management on the national forests. Grazing capacity differs on different ranges and on different parts of the same range, depending upon the character, quantity, and forage value of the vegetation, the character of the soil, the length and character of the growing season, the period of grazing, the extent and degree of depletion, also the ease with which livestock can get over the range, especially as influenced by topography, dense brush and timber, and the distribution of water. Much depends also upon the kind of range management, since the number of stock that can be grazed on a well-managed range will exceed the number on the same range when poorly managed. Grazing capacity on a given range also varies from year to year and over one period of years with another, depending upon vicissitudes of climatic conditions, gradual changes in vegetation, and other factors.

It has been necessary in national-forest range management to keep accurate check on the number of stock actually grazed, the period of use, how closely different parts of the range are utilized each year, the extent to which the range is properly grazed, and whether or not the range is declining, improving, or remaining unchanged. With this knowledge it has been possible to make necessary adjustments from time to time on individual ranges, in order to conform the number of stock to the grazing capacity, and hence to maintain the forage crop which is basic to sustained livestock production.

SEASONAL USE

Correcting improper seasonal use, whereby stock was turned onto the range as soon as the vegetation began to grow, has been a major step in decreasing range depletion. Investigations showed that early spring is a critical period in plant growth, that higher yields are obtained for the season as a whole and there is less damage to the vegetation if grazing is delayed until plant growth is well started in the spring (116). Of significance in mountainous range also is

the fact that plant growth is delayed from 10 to 14 days with approximately each 1,000 feet of rise in elevation. In the various range units and elevational zones seasonal use has been adjusted according to the average dates on which the forage plants are ready for grazing as determined by records of plant growth built up over a period of years for many ranges.

Degree of utilization at the close of the grazing season also has been found to be an important criterion in range management on most national-forest ranges. The precipitation is poorly distributed through the grazing season, many of the better grasses and weeds are of the "bunch" growth habit and do not spread vegetatively; the soil usually is not resistant to heavy trampling and consequently forage growth does not withstand close grazing. Further research is needed to ascertain the degree of utilization which may be applied with impunity to important individual range species. Pending further findings the safety rule is used of aiming to leave unutilized at the end of the grazing season in average or normal years, from 20 to 30 percent of the forage volume of the more important forage species well distributed over the range.

Of the 4,281 cattle and horse allotments and 4,872 sheep allotments on the national forests, 88 percent are now considered to have satisfactory seasonal use. On many of the remaining ranges needed seasonal-use adjustments have not been made because of the lack of sufficient spring or fall range either inside or outside the national forests. In these cases it has been necessary to practice lighter stocking, or completely rest the range after the spring grazing season.

RANGE AND CLASS OF LIVESTOCK

In order to avoid waste of feed or damage, cattle and sheep whenever practicable have been changed about so that individual ranges are utilized by the class of livestock to which the range is best adapted. Character of topography, plant species, the presence of poisonous plants obnoxious to one kind of stock but not to another, and distribution of watering places are guides that have been studied on national forests to determine the proper class of stock to graze. However, the character of the supplemental winter range or forage supply, the nature of individual livestock enterprises, or other important factors sometimes outweigh the desirability of suiting the class of stock to the range. Range protection in these cases has involved lighter stocking or shorter grazing seasons.

GRAZING SYSTEMS

Systems of grazing have been developed to insure natural reseeding to maintain and improve the forage stand. Range plants which reproduce chiefly from seed require opportunity, at least in occasional years, to mature and disseminate a seed crop if the stand is to be maintained. Artificial reseeding has been found, because of expense and lack of species suitable to range conditions, to be less satisfactory than natural revegetation, except in extreme cases.

The deferred and rotation system (114) developed by the Forest Service is well adapted to meet natural reseeding requirements on ranges used throughout the growing season. Under this system a

given range unit is divided into from three to five subunits of approximately equal grazing capacity. Grazing is deferred on one of the subunits until after the seed of the more important range plants is matured and disseminated, after which the subunit is grazed to utilize the forage and aid, through trampling, to bring the seed into contact with the soil. The next year a second area is deferred and grazing on the first is delayed as late as possible to afford opportunity for the young seedlings to become established. Each subunit is deferred in rotation in subsequent years. This system operates very successfully on sheep ranges; on cattle range fencing or natural barriers to subdivide the range into subunits are necessary. It also fits in well with livestock-production practices where lambs or cattle are marketed direct from the range in the fall, because it affords fresh range for grazing prior to marketing.

Another system introduced by the Forest Service is conservative grazing throughout the grazing season to the point where in average years, at least 25 percent of the important plants well distributed over the range will attain seed maturity. It necessitates maintaining even distribution of livestock. It is simpler to apply than the deferred and rotation method, although it involves somewhat lighter use prior to seed maturity. This system is especially well adapted for use on ranges having a relatively long grazing season.

HANDLING LIVESTOCK ON THE RANGE

Prior to the establishment of administration on national-forest ranges cattle and horses were turned loose to roam at will. Sheep were herded, but bands were moved here and there, with little reference to the welfare of other herds or the range itself. About the only restrictions were "dead lines" separating cattle range from sheep range established in a few places as the result of the early range wars. Only where water was limited and the range was controlled through ownership of the watering places was there any semblance of order.

One of the first steps on the national forests to bring order out of this chaos and to eliminate the resulting damage to the range was to designate the area upon which each owner was to graze his livestock. Sheep ranges have been divided into individual allotments, each of a size and grazing capacity to accommodate one band of sheep for the prescribed grazing season. Ranges for cattle have been divided, usually into natural topographic units, and the cattle of specified owners are assigned to particular units. Stock driveways were designated over which owners might move their livestock to and from their allotted ranges without hindrance to other range users. Thus order was established out of confusion and the users were encouraged to take an interest in the condition of their ranges and to plan their enterprises on a more secure basis. The adoption of the range-allotment system and the elimination of the waste and destruction of range forage which resulted from the needless trailing and trampling incident to the jungle competition for the choicer pieces of range was a major accomplishment in range preservation on the national forests.

Both distribution and more even use of the range have been obtained in other ways. On sheep ranges the wasteful system of trailing into central bed grounds has been terminated. Sheep owners

were encouraged, and on many national forests required, to bed their sheep where night overtook them and have the herder camp with the sheep instead of bringing the sheep to camp. Bedding in one place more than 3 nights in succession has been prohibited. Sheep owners were encouraged to practice "open herding"—allowing the sheep to spread out in quiet open formation and to restrict the use of dogs. Grazing quietly into water instead of trailing long distances and not shading up along streams was encouraged to the fullest extent. Sheepmen soon saw the value of open herding and bedding-out systems, because, in addition to conserving the range, it resulted in 5 to 7 pounds greater gains in lambs.

Desirable distribution has proved to be more difficult with cattle than with sheep, especially on rough or mountainous land. The tendency is for cattle to overutilize the flatter places and underutilize the steeper slopes. Even on rolling or flat range, cattle congregate around watering places and damage the forage, particularly if the range is not well watered. Systematically locating salt grounds and salting at the right time and in the proper quantities has done much to bring about better distribution of cattle (32).

Herding and range riding, often required of the owners of cattle using the range, is another effective method applied to obtain better distribution. Riders and herders usually pay their own way by preventing straying and other losses.

RANGE IMPROVEMENTS AND CULTURAL PRACTICES

Various improvements which have been constructed on the national forests also have done much to improve range use, check depletion, and help restore the range. Drift and division fences have been used effectively in controlling and distributing cattle. Additional water developments have been instituted to help improve distribution on poorly watered range as well as to reduce congestion and trampling around drinking places. Trails and bridges have been built to open up otherwise inaccessible range. By the reduction of poisonous plants areas have been made safer which formerly were lightly used because of danger of poisoning livestock.

Rodents have been controlled on nearly 13 million acres on the national forests under direction of the Bureau of Biological Survey—an achievement that has not only reduced range depletion but has made available much additional forage for livestock. The Biological Survey also has materially aided the livestock industry and helped increase the game supply on national forests by its constant efforts to control predatory animals.

Many tests to reseed fully depleted ranges artificially have been made by the Forest Service (52) and some reseeding has been done. This method of range restoration is considered practicable if properly done. The best sites have responded satisfactorily to the species thus far found to be suitable. Areas for seeding must be selected with care. Ranges requiring reseeding are frequently those which have lost the better top soil by accelerated erosion. Many such sites are naturally too poor to respond readily.

INTERMINGLED STATE AND PRIVATE LANDS

The administration of grazing on the national forests is complicated by the occurrence of an aggregate of 10,500,000 acres of private or State-owned range intermingled in various-sized tracts with the Federal grazing lands. Most of this land was acquired either before the national forests were established or later under the forest homestead law. When such tracts are unfenced and are grazed without correlation with national-forest land, it is difficult to prevent trespass. A satisfactory procedure has been worked out whereby the owner of such lands waives exclusive use of his private land to the Government in exchange for a permit to graze free the number of livestock equivalent to the grazing capacity of the private lands, on some more convenient part of the national forest. In 1934, 3,677,000 acres of alienated land were handled under this plan. Where the owner does not graze livestock of his own, he may enter into a cooperative agreement with the Federal Government to receive a share of the receipts from other permitted livestock. This procedure results both in simplified management of national-forest range and in the privately owned land receiving the benefit of regulated use.

RANGE-MANAGEMENT PLANS

Out of the necessity for maintaining consistent action from year to year, and because of the multiplicity of elements involved in the management of the range resources, the Forest Service has worked out a system of specific range-management planning. General plans are prepared for a national-forest and ranger district, but the individual allotment or other range unit is the basic planning unit. The more important features in the development of a management plan are an appraisal or inventory of the resources, an analysis of the problems, the setting up of objectives, and defining the plan of action to reach the objectives. As much as possible of the pertinent data are shown on maps, including grazing capacity, period of use, movements of the stock on the range, location of salt grounds, present and needed range improvements, and deferred and rotation grazing systems. The plans for individual allotments, insofar as practicable, are worked out in cooperation with the user. The current program and usually a management map are furnished each permittee or cattle association. The plans are revised from time to time as experience and observation prove this to be necessary.

A systematic method of making surveys to obtain an inventory of the range resources and other basic data for determining grazing capacity and preparing range-management plans has been developed and applied. Up to the year 1934, approximately 50 million acres or 61 percent of the total usable range had been covered by such range surveys. Acceptable management plans have been completed for 82 percent of the individual range units in the national forests, including both those based upon range surveys and those on less comprehensive information. The remaining 18 percent have unsatisfactory plans or plans in various stages of completion.

The demand for range use is so great on most national-forest ranges as to warrant making fullest safe use of the forage. Under these circumstances regular periodic inspections are necessary in

order to discuss problems with the users, see that plans are being complied with, check on trespass, and observe conditions of the range. At least two intensive inspections a year by a qualified forest officer have been found to be the minimum requirement on intensively used ranges.

OBSTACLES AND PROBLEMS IN RANGE MANAGEMENT

Numerous difficulties and obstacles have retarded a more prompt and fuller attainment of objectives and have left many problems still to be solved in range management on the national forests. Some of these would naturally arise in any attempt to establish a new order in land utilization. Others are due to economic, social, and political forces of the times. Still others are inherent in the ranges themselves.

SOCIAL, POLITICAL, AND ECONOMIC INFLUENCES

One of the more deep-seated obstacles to greater progress in range restoration on the national forests has been the delay in practical acceptance of principles of conservation by the stockmen, in spite of the fact that it was in their interest in the long run to do so. There is broad agreement as to the validity of the general theory of husbanding the resources of the land but its application has not been readily incorporated into actual practice. One has only to know the situation on most of the privately owned range lands in the West to be convinced of this fact.

That this obstacle has been encountered perhaps is not surprising. The national-forest enterprise constitutes the initial attempt in the United States to apply conservation principles on a large scale in the use of public land. It represents the very antithesis of the exploitation which, until a positive administration was undertaken on the national forests, had pervaded so much of land use in this country. It is a reversal of the old economic order of extracting everything possible from the soil for immediate profit without regard for its effect on sustained yield or future needs. More or less resistance to such a change naturally was to be expected.

Not all of the restrictions necessary to protect and maintain the range on the national forests have been opposed by the stockmen; some have been readily agreed to and others passively accepted. In too many other instances, however, there has been active opposition—sometimes from purely selfish motives—and strong political pressure has been brought to bear, all of which has greatly delayed though seldom defeated adjustments needed to conserve the range.

Economic conditions, also, have interfered with adjustments in range use. National-forest range users often have been the victims of circumstances which have forced them to think largely in terms of immediate needs and to request delays in reductions of numbers of stock or changes in practices to protect the range. The inadequate credit facilities, high interest rates, poor markets, maladjustments in land use, high cost of feed, inadequate supplemental range, aggression by stronger competitors in the use of the open public domain, and speculative land values that livestock producers have had to face, have somewhat hampered the application of national-

forest management practices. Often it has been in the interest of immediate individual and community welfare for the Forest Service to retard adjustments in range use until economic conditions were more favorable for the stockmen to meet their business obligations. During the past 5 years of economic difficulty, for example, one means of extending relief has been to delay making necessary reductions in grazing use even though these were needed to repair damage by drought and to avert further impairment of the range.

CHANGING DEMANDS

New requirements incident to the growth and development of the West have created new demands for the public use of national-forest resources. The increased demand for game and recreational use and a fuller appreciation of the requirements for watershed protection are examples. The immediate needs of range users must be considered in meeting the requirements of these broader public interests. Adjustments seldom can be made abruptly without subjecting those directly dependent on the land for a livelihood to hardships. Sometimes overzealous demands, based upon misunderstanding, as, for example, the opposition to the reduction of game animals on ranges overgrazed by game, result in sharp clashes between conflicting interests and in delayed action. Usually it is in the greater public interest to work these problems out slowly even though to do so involves some delay in range restoration.

THE WORLD WAR

The effect on the range of the United States' entrance into the World War in 1917 has already been mentioned. With the whole Nation turning its efforts toward increasing the production of materials and supplies needed for national defense, restrictions against overstocking the national-forest ranges were necessarily slackened. This was done as a part of the program to increase supplies of meat and wool, even though it was realized that to do so would lead temporarily to delayed range improvement and possibly to impairment. Some of the ranges were overstocked when the United States entered the war. The total increase on the national forests during 1917 and 1918 amounted to 188,000 cattle and 876,000 sheep, or approximately a 10-percent increase on ranges already fully or overstocked. In view of the fact that producers had been encouraged to enlarge their operations and could not liquidate on short notice after the close of the war without undue sacrifice, these excess livestock were not removed at once. The adverse economic conditions which followed shortly after the close of the war further delayed and complicated the necessary adjustments. It was not until 1923, fully 5 years after the war, that these excess livestock were all removed. In the meantime considerable damage to the range has resulted from overgrazing which called for further reductions.

DROUGHT

The variable climate has been another handicap to progress, as indicated in a previous section. Rainfall especially has varied

widely from year to year and between groups of years. The aim has been to stock the ranges conservatively enough to avoid injury from droughts of short duration. Long-term droughts have been more difficult to meet. Rainfall has been below average over most western ranges since about 1917 or 1918, and there have been years of severe drought within this period. In the very serious drought of 1928 to 1934 the absence of available feed made it impractical to remove livestock from the national-forest range, and in some cases necessitated increased use as a measure of drought relief. The deficiency in forage production without a commensurate reduction in the numbers of livestock eventuated in serious overgrazing which, together with the weakened condition of the range vegetation attributable directly to drought, culminated in serious widespread depletion of the range. To this set of circumstances is chargeable the major part of the reductions in numbers of livestock needed for range protection on the national forests at the present time.

THE CHARACTER OF THE RANGE

The physical character of the national forests themselves make it extremely difficult to apply management which will result in uniform improvement of the range. The wide variation in elevation from foothills to high mountain tops, the broken topography, differences in soils, slopes, and exposures, and the resulting differences in climate and growing conditions, give rise to a variety of conditions as to plant cover and usability of the range often within a horizontal distance of only a few miles. The vegetation on the whole is naturally not resistant to close use or heavy trampling. The balance between plant cover and stability of the soils is delicate and the steep slopes, thin cover, loose soils, and torrential rainfall induce erosion immediately when the plant cover is broken. Because of all these conditions local overgrazed areas or "sore spots" have persisted.

Soil depletion, as the result of overuse and consequent erosion existent on extensive areas when grazing administration was undertaken, has been a serious handicap to range restoration. Rehabilitation of these soils necessarily is a slow process and insufficient time has elapsed to result in much improvement. On some ranges in Utah, for example, there has been but slight recovery on severely eroded soils on which grazing has been excluded for the past 20 years.

MALADJUSTMENTS IN RANGE USE AND OWNERSHIP

When first placed under regulation much of the national-forest range was being grazed for longer seasons than proper management would allow. Solution of this problem has been slow and difficult because of the shortage of available spring and fall range on outside land. Certain of the outside range lands which might best be used for this purpose in connection with national-forest range—including parts of the open public domain—were being used at other seasons. Much of the available spring and fall range was badly depleted. The area originally suitable for this purpose has been greatly reduced by cultivation. As yet the seasonal-use problem has not been satisfactorily solved on 12 percent of the national-forest range allotments.

nor will be until some major readjustments are made in use of the outside land.

Other maladjustments in ownership or control of land which complicate range management exist within and along national-forest boundaries. Approximately 12 percent of the grazing land within national forests, or about 10,500,000 acres, is alienated and of this only 3,677,000 acres is being handled as an integrated part of national-forest range units. Efforts to exclude all but timber and important watershed land when the national forests were established as well as subsequent eliminations have resulted in many natural range units being left partly inside and partly outside the national-forest boundaries. This has prevented proper management and coordination of use of land both inside and outside the forests.

DELAYS IN THE DEVELOPMENT OF RANGE MANAGEMENT

Still another handicap to higher attainment on national-forest ranges, already mentioned, was the lack at the outset of an experienced and trained personnel and the paucity of knowledge of range management. Range management was a new field in which the ground had scarcely been broken. It was only as the personnel became better trained and more experienced and as new facts and principles were developed by research that standards and practices of the "rule-of-thumb" era were discarded and scientific range management began to take shape.

Lack of sufficient funds to carry out various undertakings as soon as they were recognized to be needed in the application of better range management has been another cause for delay. Earlier installations of fences and watering places would have helped to speed up range rehabilitation. The range-research program has been slow in getting under way. A larger technically trained range-management personnel is needed. Numerous problems, many of urgent importance, remain to be solved. There are 56,800,000 acres of national-forest range land still to be covered by resource surveys to supply data for the preparation of adequate management plans.

RANGE-DISTRIBUTION POLICY

Most of the ranges were already fully occupied when the national forests were established, chiefly by large livestock owners who were operating on an industrial basis, but also by homesteaders and other settlers who had come in and were beginning to gain a foothold on the range. The country was still in the developmental stage. The West was looked upon as the land of opportunity for the home seeker. The general conception of the times was that all an individual needed was the opportunity to obtain a piece of land and a few head of livestock and with the free play of economic forces he would eventually build up an economic home unit; the national-forest regulations were framed to foster this kind of development.

In carrying out this objective with regard to the use of the range, the following policies have been applied in the allocation of grazing privileges: (1) Preference is given to the small settler or home builder to afford him an opportunity to build up his agricultural enterprise into a unit capable of satisfactorily supporting a home;

(2) in order to obtain the highest use of both public range and farm land, preference is given to owners of farm land or winter range who require summer range for the number of livestock they can support during the remainder of the year with the products of their cropland or on owned range land, or both; (3) no rights have been allowed to accrue to permittees, but in order to promote stability in livestock agriculture, individuals best qualified under the regulations have been safeguarded in their use of the range to the fullest extent consistent with objects of the national forests and the needs of other qualified range users.

Permits to graze were issued at first to all stockmen who had been making bona-fide use of the range for a number of years prior to the time it was set aside as national forest.

Rules and regulations designed to encourage redistribution to small owners without forcing sudden sacrifices on bona-fide, previously established users were then applied and subsequently have been followed in the issuance of the year-to-year or occasional term permits.

Ownership rather than leasing of land is given prior consideration because leasing lacks permanency and involves the elements of speculation. Residence on the ranch property is given preference over nonresidence.

In order to interfere as little as possible with legitimate business transactions, the permit of an established permittee is renewable to the purchaser of the dependent and otherwise qualified ranch property of an established permittee, or of permitted livestock, if the purchaser already owns properly qualified ranch property. Since a grazing preference is a privilege and not a right, it must be waived by the seller of the ranch or livestock to the Government which in turn renews it to the new purchaser. In the case of the death of an established range user the permits may be renewed to the heirs. Whenever the range is overstocked or there is a demand by other better qualified users, the size of the permit to the purchaser or heir may be reduced prior to renewal.

In order to prevent monopoly of the range by the purchase of ranch lands or livestock entitled to a grazing preference, and the exclusion thereby of other qualified users, a maximum number any individual may graze has been established for each national forest, beyond which a permit number may not be increased, except under extraordinary circumstances.

Minimum limits also have been established below which no permit number is reduced, to make room for new users or to increase small permits. Such reductions are made on the larger sized permits. This minimum limit is, in each case, an approximation of the minimum number of livestock which, in connection with the owned farm and range land, will help to produce a reasonable standard of living for a family, and varies depending upon local circumstances and conditions. It is lower where it relates to diversified agricultural enterprises in which the grazing of a few livestock is essential to supplement farm-crop production. It is higher where it applies to enterprises where livestock raising in connection with forage-crop production or owned winter range is the chief source of income.

OUTCOME OF DISTRIBUTION POLICY

The system of allocating the use of the range on the national forests on the whole has contributed materially to the stability and maintenance of western livestock agriculture. The practice of relating the use of the public range to the other agricultural resources has resulted in making both types of land contribute a higher economic return than if each had been used independently. The administration of the national forests has been the largest accomplishment in planned land used in the West. The forage supply on national-forest range has been the most dependable of all of the factors entering into the economy of livestock producing enterprises. The advantage which the bigger, more aggressive operator might have exercised on the range by virtue of stronger financial position and greater resourcefulness has been removed.

However, the expectation that there would be a material building up in the number of individuals benefited and in the number of livestock they each grazed has not been fulfilled. Instead of a wider distribution of grazing privileges among a larger number of individuals, the situation, especially with cattle, is much the same as in 1909.

There were 27,237 permittees in 1909 and 26,224 in 1934. The relative number of cattle permittees in each of four permit-size classes, as shown in table 50 (columns 2, 5, 8, and 11) has remained approximately the same over the 25-year period, as has also the relative proportion of the number of cattle in each class (columns 3, 6, 9, and 12) and the average size of the permits (columns 4, 7, 10, and 13). The only notable exception has been a decrease in the average size of permit in class IV, the largest size class, from 501 head in 1909 to 425 head in 1934. The smallest size class of permittees, who make up 62 percent of the total number, own only 15 percent of the total number of cattle grazed. On the other hand, the 7 percent of cattle permittees in the largest size class own 44 percent of the total number grazed.

The situation with sheep is somewhat different. Sheep permittees number only about one-fourth as many as cattle permittees, although they own approximately one-half the combined livestock units (sheep being counted at a 5 to 1 ratio with cattle). The relative number of permittees in the small-size class (column 2 in table 50) has increased appreciably as has also the relative number of sheep in this class (column 3); however, a part of this increase, as well as a part of the decrease in the number of class I cattle permittees is due to permittees having exchanged from cattle to sheep. There has also been a decline at the opposite end of the scale, in

TABLE 50.--Distribution of grazing permits on the national forests, according to size classes, 1909-34

CATTLE 1

Year (1)	Class I (1-40 head)				Class II (41-100 head)			Class III (101-200 head)			Class IV (over 200 head)			Average size of permits of all grades (14)
	Number of per-mittees (2)	Number grazed (3)	Average size of permit (4)	Number of per-mittees (5)	Number grazed (6)	Average size of permit (7)	Number of per-mittees (8)	Number grazed (9)	Average size of permit (10)	Number of per-mittees (11)	Number grazed (12)	Average size of permit (13)		
1909-----	Percent 64	Percent 15	Number 16	Percent 20	Percent 19	Number 68	Percent 9	Percent 18	Number 149	Percent 7	Percent 48	Number 501	Number 72	
1914-----	66	15	16	19	18	67	8	18	145	7	49	484	68	
1919-----	65	16	17	20	20	67	8	17	146	7	47	497	69	
1924-----	64	15	17	20	20	67	9	18	144	7	47	476	69	
1929-----	64	15	16	20	18	66	9	20	144	7	47	445	70	
1934-----	62	15	17	21	20	66	10	21	146	7	44	425	69	

SHEEP 2

Year (1)	Class I (1-1,000 head)				Class II (1,001-2,500 head)			Class III (2,501-4,000 head)			Class IV (over 4,000 head)				Average size of permits of all grades (14)
	Number of per-mittees (2)	Number grazed (3)	Average size of permit (4)	Number of per-mittees (5)	Number grazed (6)	Average size of permit (7)	Number of per-mittees (8)	Number grazed (9)	Average size of permit (10)	Number of per-mittees (11)	Number grazed (12)	Average size of permit (13)			
1909-----	Percent 48	Percent 13	Number 422	Percent 38	Percent 39	Number 1,596	Percent 8	Percent 17	Number 3,160	Percent 6	Percent 31	Number 7,386	Number 1,541		
1914-----	47	13	416	39	42	1,550	8	16	3,102	6	29	7,005	1,469		
1919-----	57	18	381	32	41	1,529	6	15	3,204	5	26	6,667	1,207		
1924-----	61	19	356	29	38	1,534	6	16	3,222	4	27	6,783	1,159		
1929-----	64	22	359	27	40	1,508	5	15	3,120	4	23	6,690	1,042		
1934-----	62	21	368	29	42	1,528	5	14	3,178	4	23	6,647	1,071		

1 Includes a relatively small number of horses and a few swine, not segregated for the purposes of this discussion.

2 Includes a relatively small number of goats, not segregated from sheep for the purposes of this discussion.

relative number of permittees (column 11), in relative total number of sheep grazed (column 12), and in average size of permit (column 13). These decreases have been reflected in a decline of about 30 percent in the average size of sheep permit (column 14). The data on sheep permits, therefore, indicate that there has been noticeable redistribution among the various size classes.

Size of permit, however, is not the only criterion of sufficiency of numbers of livestock to meet the needs of individual permittees. The size classes, especially for cattle and to some extent for sheep, shown in table 50 relate to many kinds of livestock-agriculture enterprises, varying from small diversified farms with a few head of cattle or dairy farms which require summer range for a few head of young animals, to practically exclusive livestock-producing ranches, with all sorts of combinations in between. A few to 40 head of cattle or up to a few hundred sheep, for example, form a very valuable and usually sufficient adjunct to other farm production on a diversified farm, both as a source of fertilizer for field soils and of cash income. On the other hand, this small number is seldom sufficient to round out a satisfactory home-supporting unit when livestock are the chief source of income. Since the permits relating to the various kinds of livestock-agriculture enterprises are not segregated in the available data presented in table 50, size of permit alone does not show the full significance of the range-use distribution policy of the Forest Service.

In order better to understand the influence that economic forces may have had on size of permits on national forests, a comparison should be made with otherwise similar livestock-agriculture enterprises which do not participate in the use of national-forest range; but data to make such comparison are not available. A possible hint along this line, however, is contained in the census data showing that the average number of cattle and sheep per farm in the 11 Western States has decreased in approximately the same degree as the average size of permits on the national forests. The average size of cattle permit declined from 72 head in 1909 to 69 head in 1934, and the average number of cattle per farm from 24 head in 1910 to 20 head in 1930. Similarly, sheep per farm declined from 74 head in 1910 to 50 head in 1930, or about 32 percent as compared to a decline of about 30 percent in average size of sheep permits on the national forests. It would appear from these data that the trend has been approximately the same among owners who do or do not use the national-forest ranges.

Many factors other than the policy of administration as expressed in the Forest Service regulations have had an influence in the redistribution of grazing privileges on the national forests, and in many instances these may have dominated. Adequate data are not available for a thorough analysis but, as shown in the following paragraphs, certain conclusions may be based on the information at hand.

During the period 1909 to 1934, a fairly large number of permits was granted to owners in the smallest size class who had not previously used the national-forest range. Substantial reductions were made also in the larger-sized permits to provide range for the beginners and to increase the size of many of the smaller permits. In a few places permits in the two intermediate size classes have been granted to new applicants but only where unused range was not wanted by small operators. Practically all of the reductions in size of permit for the benefit of range protection have been made in the larger-sized classes. Only in rare instances, where there were not enough large permits to absorb the reductions needed for range protection, have cuts been made in the smaller-sized permits.

In spite of this deliberate action by the Forest Service and a negligible number of cancelations of grazing permits for the persistent violation of the national-forest regulations or for other cause, there has been a slight decline in the relative number of small cattle permittees. Furthermore there has been no sustained increase in the average size of permits held by them.

Many of the small permit holders have sold their ranch property or permitted livestock or both to other stockmen to whom the permit has been renewed and in this manner two or more preferences in numerous instances have been combined. In some cases small operators have built up their permits into the next size class. In other cases larger operators whose permits have been reduced either for redistribution to other users or for range protection, subsequently purchased additional livestock or ranch property of some smaller permittees, and in that way many of the larger permits have been more nearly maintained than otherwise would have been the case. For still other cases, the permits, usually in the small size classes, have been voluntarily abandoned.

A study made in several of the Western States in 1935 indicates the extent to which preferences have been passed from one permit holder to another or abandoned during the period 1905 to 1934. In Wyoming, Idaho, Nevada, and eastern Oregon, as shown in table 51, there has been a relatively heavier dropping out of small permittees and the larger permits on the whole have been the most stable. On the other hand, in Utah the small permits have been more stable and more of them are still in the hands of the original holders than in any of the other States. In Utah, relatively more of the permit holders are engaged in diversified farming or outside labor and depend less upon livestock for their income than in the other four States. A study in eastern Oregon shows further that about 75 percent of the permittees who have dropped out did so within 5 years after obtaining a permit. These data suggest that where livestock production is the chief source of income, the small-sized permits are not economically sufficient and after a few years of use the livestock are sold and the permit is transferred to a new holder, either another new small owner, an already established small permit holder who is endeavoring to build up to an economic unit, or an established large-sized permit holder who desires further to build up his permit.

The data in table 51 also indicate a considerable lack of stability in ownership of livestock in all permit-size classes. During the past 30 years there has been an average of almost two predecessors for every present permit holder or an average length of life of a permit of between 10 and 15 years. This succession in ownership is ascribed to the unsettled condition in agriculture in the Western States. The lowest turn-over on the average has been in Utah where there is more extensive diversified farming in the vicinity of the national forests and a more settled type of agriculture than in the other States. No data are available to afford a comparison in stability of livestock ownership by ranches using outside range with those using national-forest range.

TABLE 51.—*Percent of original permittees who have dropped out on national forests in 5 Western States, 1905-34*

Size class	Utah	Wyoming	Idaho	Nevada	Eastern Oregon
CATTLE					
I (1 to 40 head).....	Percent 61	Percent 94	Percent 73	Percent 87	Percent 87
II (41 to 100 head).....	54	53	65	81	78
III (101 to 200 head).....	63	54	69	60	79
IV (over 200 head).....	69	37	46	61	73
SHEEP					
I (1 to 1,000 head).....	45	57	82	73	85
II (1,001 to 2,500 head).....	39	33	75	56	79
III (2,501 to 4,000 head).....	50	0	75	67	77
IV (over 4,000 head).....	75	12	67	55	77

These admittedly incomplete data substantiate a conclusion based on wide observation, that economic forces beyond the influence of the national forests have played a large part in controlling the distribution of grazing privileges. Small-sized permits, except where associated with diversified farming or other source of income, because of being undersized or submarginal in character, have proven insufficient in many instances to constitute a base upon which the small settler might build a satisfactory home unit and have been abandoned or transferred from one holder to another. More often the transfers are to a larger permit holder because the small permit holder who might like to enlarge is unable to buy the necessary land upon which to care for his livestock for the portion of the year they are not on the national-forest range.

Other factors have had some influence also. One of these is the term permit. When these are in effect there is less opportunity to make reductions on the larger permits for the benefit of smaller holders.

A second factor has been the need for making reductions in number of livestock grazed for the purpose of range protection. Almost all of these reductions have fallen on the large operators, and when these cuts have been heavy there has been a reluctance on the part of the Forest Service to make additional reductions for the purpose of admitting new permittees or granting increases to small permit holders.

In some degree also the Forest Service perhaps has not been aggressive enough in carrying out the policy of redistribution in favor of the small settler. There are a number of rather large permits still in existence, although all of them have been greatly reduced at one time or another. Some of these at least, after having been reduced, have been built up again through purchase by the holder of ranch property or livestock of another permittee. On the other hand, the small number of livestock granted to many of the small permittees undoubtedly has been insufficient to constitute economic-sized operating units, and the permits have been given up or the livestock sold to someone else. The heavier turn-over in small permit holders in many States strongly suggests this possibility. The alternative would be granting an economic-sized permit to begin with. At any rate, it is apparent that merely granting a small permit will not suffice as the sole basis for building up an economic unit, and the fact remains that there is still a large number of small farmers in and adjacent to the national forests, many of whom have no permit at all and others who have only a small permit, insufficient satisfactorily to support a home.

The national-forest range, however, is insufficient to afford anywhere near an adequate size of permit to all of these settlers, even if the larger-sized permits were eliminated entirely. Further redistribution of grazing use on public land is desirable in many localities, some of which can be done without more fundamental adjustments, but the lack of sufficient range to meet all needs suggests the necessity of finding other means than further distribution in the use of national-forest range alone to solve the problem. It would be unwise to attempt redistribution on a big scale without a sounder basis than the present available information can afford. At most, it is a national-forest problem only in part. All ownerships of land, including farm land, privately owned, and State range land, the grazing districts, and the remaining open public land, should be considered together in order to adjust and harmonize ownership and use among all classes of land. There are two courses to follow, either the doctrine of laissez faire, in which the fittest will finally survive, which, except for the preference given the smaller permittees on national-forest range, has been the policy of the past, or the planned way of ascertaining the facts relating to all classes of land and then determine the course which will result in the greatest benefit to the greatest number of people. This constitutes one of the major unsolved problems in national-forest and other types of land use.

NET RESULTS OF 30 YEARS OF RANGE ADMINISTRATION

The national forests represent the pioneering effort to apply conservation and planned land management on a large scale in the United States. During 30 years of intensive administration, range management on these areas has been confronted by the many obstacles and difficulties detailed in the preceding pages, all of which have in some measure hindered and delayed necessary action and retarded the accomplishment desired. During this period, however, definite aims and objectives in line with maintaining and improving the natural resource have been held to, whereas on private and most

other public ranges exploitation of the resource has continued with little effort to control it.

The net results of these 30 years of effort may be summarized as follows:

1. The trend of depletion of the range has been checked, and notable improvement is the rule. The grazing capacity of the range area in use in 1934 has been improved 19 percent since 1910. Grazing capacity on national-forest ranges today is, on the whole, 70 percent of that on virgin range, as compared to 33 percent on the grazing districts and the public domain and 49 percent on privately owned lands in the Western States. At the present time, even in spite of a long period of deficient rainfall, the 1928-34 drought, and the extra demands of the 1929-35 depression, only 19 percent of the range area on national forests is in such condition as to require major adjustments in use to permit continued improvement.

2. The watershed lands, which include the heads of practically all of the important streams furnishing water for irrigation, hydro-electric power, and domestic use in the West, have been protected from serious damage and are mostly in an improved condition. Many mountain streams subject to destructive floods and mud flows from torrential summer rains when the national forests were established seldom have such floods today. Disastrous floods on national-forest watersheds are rare occurrences except from recent burns or those few areas on which an adequate cover has not been restored. This is in sharp contrast to much similar privately owned or other Federal lands, excepting the ungrazed national parks and municipal watersheds. Erosion of topsoil and gullying have in a large measure been checked on national forests, although they are still too prevalent. They are extremely small in relation to the extent of erosion on other lands. Along with the benefit of watershed protection, streams in the national forests have been maintained in condition to support trout and other game fish.

3. The policy of "multiple use" developed on national-forest land has made available all of the resources in a manner to obtain the highest net use of all the land. Of the 87,954,000 acres of usable grazing land only 5,416,000 acres have been closed for other more important uses. On the remaining 82,538,000 acres, watershed protection, timber production, grazing, production of wildlife, and recreational use are correlated and harmonized.

4. When the national forests were established, the population of wildlife in the Western States was at or near its lowest point in history. By giving wildlife a definite place in land management, by urging and assisting in the enactment of better State game laws, by cooperating with the several States in game-law enforcement, and in the establishment of more than 100 game refuges on the national forests, and by developing better game management, the number of game animals and possibilities for hunting have been greatly increased. The control of predatory animals under the direction of the Biological Survey has also helped greatly in raising the game population. Big-game animals on range lands in 1924, the first year complete estimates were made for all species, numbered approximately 613,000 head. In 1934 they were estimated to number 1,084,000, or an increase in that period of 77 percent. By developing roads into the national forests and by planting fish in

streams in cooperation with other Federal agencies and States, recreational sport has been made available to hundreds of thousands of fishermen. The additional hunting and fishing not only has added to recreational enjoyment by city and country people alike, but the goods and services required by sportsmen have added to the business of merchants, hotels, and guides in the communities adjacent to the national forests.

5. The giving of preference in the use of the forage resources on the national forests to nearby residents who need summer-range land to supplement and properly utilize their farm and winter-range land, and thereby to supplement and round out farm or ranch home units, has resulted in higher use of both the national forest and privately owned land. It represents one of the few large-scale efforts to put better land use into effect. Although successful insofar as it has gone, accomplishments have been limited by maladjustments in land use and ownership, economic conditions, and other factors outside the national forests.

6. The aim of protecting the small operator and affording him the opportunity to build up an economic home unit has been accomplished only in part. National-forest administration helped to put an end to range wars, eliminated the nomad operator on the summer range, and protected the little man against monopoly of the range by his stronger, more aggressive neighbor. Small operators have been afforded more than equal opportunity with large operators to use the range. The various other elements in range livestock production, including credits, markets, cost of feed, and land values, have been far less stable or dependable than the availability and cost of national-forest range forage. However, the expectation that many of the smaller operators would build up into units capable of satisfactorily maintaining a family has not been realized. Large operators are fewer in number and have been reduced in size in order both to stop overgrazing the range and to make more range available to small operators. Nevertheless, the relative number of small operators and the average number of cattle grazed by them have not been increased, although there has been an increase in the number of small sheep owners. The lack of increases in the case of cattle is believed to be due in a large degree to maladjustments in land use and ownership outside the national forests and in some degree, probably, to a too conservative application of the redistribution policy.

7. The final objective in the protection, development, and use of the national-forest resources is the establishment and maintenance of a stable population. The net results of the dependability of the range-forage crop, the greater opportunity for small operators, correlation of national-forest range with dependent farm and ranch land, and multiple use of the related resources has contributed materially to stabilizing home and community development. The settlements around the national forests have a dependable supply of wood, water, forage, game, and recreational advantages. These lands are great reservoirs of useful work in time of economic stress. The counties in which national-forest ranges lie receive 25 percent of the receipts collected for grazing and other uses for their roads and schools. The development and protection of the national-forest properties and other work done by the Federal Government is a source of income to local labor, has relieved the several States of

heavy expenditures, and has prevented the waste of resources basic to the welfare of these States.

8. In its endeavor to solve its own range land and watershed problems the Forest Service has developed a science and practice of range management and watershed protection which is applicable to other classes of range land as well. It has pioneered the way in the soil-croson problem on forest and range lands and was the first to undertake comprehensive study of it. It has been among the first to study and obtain concrete information on the range problem on the open public domain and has constantly urged action to correct it.

9. The average annual cost of administration of grazing on the national forests for the 4 years ended June 30, 1935, was 0.89 cents per acre of usable range. This cost, however, does not include the cost of range improvements constructed with emergency and relief funds and personnel during 1932 to 1935. Present personnel and facilities for administration, however, are inadequate to render the services required and should be enlarged. The income from grazing for this period amounts to 1.46 cents per acre. Whether or not this cost of administration is too high should be judged only on the basis of the needs of this job. The Forest Service has held to two broad aims or objectives—conservation and protection of the resources and provision of the maximum public benefits therefrom. Either or both may be sacrificed; but if so, it must be expected that cheaper administration will result either in damage to the resources or in reducing use to a point where the dependent population will be denied the resources which otherwise might be available to them, either of which lead to social and economic losses.

These accomplishments are attributable to the following:

1. The setting up of definite aims and objectives and adhering to them.
2. Anticipating problems and preparing to meet them.
3. A decentralized form of organization.
4. Professional resident management.
5. Accepting full responsibility for decisions, even when superficially contrary to immediate advantage of range users.
6. Equal consideration for all resources.
7. A long-term viewpoint which leaves the way open for meeting new needs as they arise in the use of the resources.
8. Jurisdiction over the national forests in the Department of Agriculture, where activities relating to growth from the soil are grouped.

Many problems remain to be solved. Further adjustments are needed to reduce use to the grazing capacity of the range. Seasonal changes are needed on 12 percent of the grazing allotments. Management plans including range inventories have not been completed for all the ranges. Additional improvements, artificial reseeding, and other work remain to be done. Adjustments must be made as needed to meet the requirements of multiple use. During 1932 to 1935 intensive range management has lagged, owing to so much time of resident forest officers being required on emergency relief work. Probably the biggest single unsolved problem in connection with the national-forest ranges is the development of a more adequate basis for distributing grazing privileges in accordance with sound social and economic policies. This involves correcting malad-

justments in land use on outside agricultural land as well as a resurvey of national-forest policies. Additional research is the foundation to the solution of many of the problems.

INDIAN LANDS

Range lands within Indian reservations occupy a unique place in the consideration of the national-range situation. This is so, not on account of the considerable area or commercial importance, but because these lands belonging to the Indians constitute a definite responsibility of the Federal Government for management and administration.

The legal status of each Indian reservation or individual tract of Indian land now rests firmly on the provisions of an Indian treaty, and Executive order, or Federal patent, definitely recognizing or establishing indisputable Indian title to the property and in most instances restricting passage of this title. The Indians are wards of the Federal Government and this guardianship extends to the supervision and administration of the Indian lands.

The uses to which the Indian range has been devoted, the steps taken in its administration, the present ownership status, and even the extent and physical condition of the resources are intricately involved with the ever-changing degree of interest in Indian affairs; and are reflections of the efforts of the Federal Government to direct the use of the land resources of the Indian toward fostering his social and economic development. The multiplicity of aims and social theories involved has resulted in a rather complicated pattern of achievement.

In 1849 the Bureau of Indian Affairs was transferred from the War Department into civil control as a bureau of the Department of the Interior. Since then the functions of the Bureau of Indian Affairs have been developed to a high degree of beneficent paternalism. In addition to providing services as an aid to the health, education, employment, and other personal needs of the Indians, progressive steps have been taken in the management and development of the reservation properties, including activities directed toward the conservative management of the Indian range lands (83).

INDIAN RANGE RESOURCES

Over 80 percent of the total land in Indian ownership is within the range livestock-producing regions of the West. Plant types and forage characteristics of these broad regions have been fully discussed in an earlier part of this report, and are not reviewed here except to mention that the forage on the various Indian reservations is basically the same as that which occurs generally throughout the territory of which they are a part. Several plant types suitable to the ranging of both sheep and cattle are found on each major reservation regardless of location. The distribution of Indian land valued for forage production by States and grazing types recognized by the Indian Service, as compiled from 1934 statistics, are presented in table 52. Of the 43,200,000 acres given a range-land classification, slightly over 3 million is listed as barren or waste, leaving a balance of over 40,000,000 acres for use by livestock.

On nearly all of the 47 reservations summarized in table 52, full use is made of the annual forage crop. In 1934 approximately 10 million acres were under temporary lease or permit to whites, pending the time the range is needed for Indian livestock. Indian livestock owners paid grazing fees on an additional 1.7 million acres and on the remainder, comprising nearly three-fourths of the total, Indian-owned livestock were grazed on a free use basis.

The relative proportions of white and Indian ownership and the total livestock reported using the range in 1934, are shown in table 53.

TABLE 52.—Areas of Indian reservations of range importance by types and States

State	All range land	Open land	Sage and browse type	Coniferous timberland	Woodland	Aspen	Waste and barren
	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>
Arizona.....	22, 318, 555	9, 520, 391	4, 860, 534	2, 230, 441	3, 706, 118	3, 740	1, 997, 331
California.....	372, 935	21, 825	123, 840	33, 620	68, 812	-----	134, 838
Colorado.....	533, 332	44, 000	49, 000	418, 186	12, 814	-----	12, 332
Idaho.....	424, 484	10, 000	370, 324	44, 160	-----	-----	-----
Montana.....	5, 582, 196	3, 987, 568	423, 524	403, 964	386, 840	101, 200	279, 100
Nevada.....	804, 507	112, 973	585, 779	3, 355	-----	1, 000	101, 400
New Mexico.....	3, 641, 063	1, 606, 707	613, 942	722, 380	432, 275	2, 000	263, 759
North Dakota...	944, 628	854, 814	26, 630	-----	30, 064	5, 980	27, 140
Oregon.....	1, 539, 723	80, 754	204, 026	1, 204, 004	35, 939	-----	15, 000
South Dakota...	3, 730, 422	3, 514, 794	-----	50, 493	36, 240	-----	128, 895
Utah.....	401, 108	113, 179	178, 219	26, 880	62, 500	2, 500	17, 830
Washington.....	2, 110, 210	342, 587	337, 387	1, 396, 217	-----	-----	34, 019
Wyoming.....	829, 440	193, 526	370, 205	125, 000	3, 600	800	136, 309
All States..	1 43, 232, 603	20, 403, 118	8, 143, 410	6, 658, 700	4, 775, 202	117, 220	3, 147, 953

¹ The total area of range available to domestic livestock on Indian lands in the West, as shown elsewhere in this report, is 48,391,000 acres inclusive of small areas of waste range within the larger bodies of range and. The acreage shown in this table is exclusive of public domain Indian allotments, small fenced tracts within reservations, or other areas within Indian ownership which have not been classified as to forage type. In the few instances where a reservation extends into two States it is listed here and in following tables with the State in which the Indian agency is situated.

TABLE 53.—Indian- and white-owned livestock on ranges, 1934

Ownership	Cattle	Horses	Sheep	Goats
	<i>Number</i>	<i>Number</i>	<i>Number</i>	<i>Number</i>
Indian.....	229, 343	134, 863	901, 765	215, 566
White.....	227, 460	24, 943	671, 933	-----
Total.....	456, 803	159, 806	1, 573, 698	215, 566

The Indian-owned livestock make use of the reservation range for the yearlong period except when it is covered with snow. In some localities, particularly on the northern reservations, supplementary feeding is practiced; but by far the larger percentage of the Indian stock graze yearlong on the reservation ranges. The white-owned stock generally is grazed under permits specifying the season of use, which varies from a few months of intensive summer grazing to more moderate use over a longer period, depending on the nature and location of the range. The Indian ranges on the larger reservations are quite important sources of feed, and there is ready demand for use by white-owned livestock of the forage not needed for Indian livestock.

The present condition of the ranges varies widely in different regions. The Indian range lands in Oregon and Washington, except for some minor localized injury due to faulty distribution of stock, are in good condition. On the northern Great Plains reservations, where the native sod of buffalo grass has been undisturbed and the area used solely for grazing, the ranges are also generally in fair to good condition. Some futile attempts at dry farming have destroyed the native vegetation, but it is estimated that somewhat less than 100,000 acres of plowed Indian land in the Plains States should be returned to grass.

In the Southwest the situation is serious. Approximately one-half of the total range lands in the Navajo, Hopi, and Papago country, particularly, is seriously overstocked and presents a severely overgrazed condition. Erosion by both wind and water has removed and is still removing the fertile topsoil on hundreds of thousands of acres. The condition of these ranges, in spite of the first steps toward corrective measures which have been taken, is steadily growing worse. The fine texture of the soil and the absence of sod-forming vegetation, together with irregular torrential showers, cause a heavy run-off which results in serious damage (90). Drastic action toward livestock reduction and range rehabilitation will be necessary on millions of acres before the Indian range lands of this region are again capable of making their full contribution to the welfare of the Indian owners or the Nation as a whole (161).

A survey of western ranges made in 1935 indicates that the Indian lands on the whole have been depleted approximately 51 percent of virgin condition, and about 4 percent of the total usable range area is extremely depleted, 54 percent is severely depleted, 36 percent is materially depleted, and 6 percent of the range is only moderately depleted. It is believed that in virgin condition these Indian ranges had a grazing capacity at the rate of 4.2 acres for each animal-unit month. The present carrying capacity is approximately 8.2 acres per animal-unit month, although the ranges are now stocked at the rate of about 6.0 acres per animal-unit month. Over the past 30 years the trend in condition has been downward on 75 percent of the Indian ranges, and there has been improvement on about 10 percent. During approximately the past 5 years the trend has been downward on 63 percent, and there has been improvement on about 4 percent of the total range area.

ADMINISTRATION OF INDIAN RANGE

The record prior to the organization of the forestry unit in the Bureau of Indian Affairs in 1910 does not indicate that any considerable attention or systematic effort was given to the supervision of Indian range lands, even though in 1891 the leasing of Indian lands for grazing purposes was authorized by law. Indeterminate numbers of livestock made seasonal or yearlong use of the range, largely on a trespass basis, and the various efforts toward interesting the Indians themselves in the livestock industry met with varying degrees of success.

For 6 to 8 years after 1910 some attention was given to the range situation in the Southwest by the forestry unit of the Indian Service.

A system of range allocation was inaugurated, and fees were collected for grazing privileges. This work was subsequently turned over to the various reservation superintendents, and thereafter but little real progress in range control was made. Some years later, but prior to 1920, as forestry organizations were developed on the reservations of the Northwest, the responsibility for the supervision of grazing activities was gradually assumed on the more important forested reservations of this region. Range lands were organized into grazing units, a permit system with a definite control of the number of stock and season of use was adopted, and an orderly program of management was placed in effect (154, pp. 607-632). As a result of the progress made in range administration on the reservations of the Northwest and of the growing recognition of the importance of range conservation, the supervision of all grazing activities on Indian lands was delegated to the forestry branch in 1930.

A definite and systematic program of range management for application on all reservations was initiated, directed toward the conservation and regulated use of range resources. To the extent allowed by the funds available, a technically trained personnel has been developed for range administration. The objectives were definitely stated in the grazing survey report previously cited, and were approved by the Secretary of the Interior June 4, 1931. In abbreviated form, they are as follows:

1. The preservation of land, water, forest, and forage in a safe and entire state.

2. The permanent welfare of the livestock industry generally and the Indian livestock industry in particular.

3. The protection of the interests of the whole Indian people against unfair competition by the more aggressive individuals.

4. The conservative utilization of all forage resources, primarily through the development of the livestock industry among Indians, and secondarily through the regulated sale of grazing privileges.

On the forested reservations of the Northwest these regulations served to strengthen the plan of administration already in operation, and but little modification of range-management practices was required. On other reservations used largely by white-owned stock there was considerable opposition, both on the part of the Indians as landlords (161) and the livestock operators as lessees, to the inauguration of this more positive system of range management.

Much more encouraging progress has been made on the ranges used by white operators than on ranges used by the Indians themselves. In the Southwest, although many thousands of sheep and goats have been removed from the Navajo ranges and constant effort for further improvement is steadily being made, progress toward sustained-yield management has been relatively slow. An extension program directed toward improving their knowledge and understanding of range management has been instituted among the Navajos as a part of the plan for gradually reducing the number of stock on the overgrazed ranges. The problem of the administration of Indian range lands, with its many ramifications, has by no means been solved, but definite steps toward sustained-yield management have been taken, and further progress seems assured.

SPECIAL HANDICAPS IN ADMINISTRATION

LAND STATUS

The governmental policies which have been applied with respect to Indian lands have resulted in a highly involved land status on some of the reservations today which has greatly complicated management of the range resources. From colonial days until recently the friends of the Indians, without exception, tried to lead, persuade, or force them into the settled domestic mode of living which the white man had developed and which has proved so satisfactory to him. A permanent home instead of a nomadic life, a family group instead of a tribal band, domestic livestock instead of wild game, and individual instead of communal ownership of land, were considered to be necessary for the proper development of the Indian.

In carrying out these principles the Indians were encouraged to make selections of land on their reservations and these selections were then conveyed to them as allotments. When the Indians of a reservation had each been allotted land for homemaking and tribal reserves of timber and grazing grounds had been made, the surplus lands were in many instances opened to homestead entry or disposed of in other ways with the proceeds of disposal credited to the tribal funds.

Many variations of this land program were applied on the numerous reservations in the Northern States, and as a result much land unsuited to individual development has been passed into private ownership. In the Southwest, owing to the stronger communal traits of the Indian people and the more obvious unsuitability of the reservation land for use in small tracts, this land-disposal program was not so generally applied.

As a result of the various land transactions within the boundaries of many reservations there are five distinct classifications of land ownership:

1. *Ceded and alienated*.—Lands to which the Indian title has been completely extinguished by Executive order, Federal purchase or comparable governmental action.

2. *Alienated allotments*.—Lands in homestead size tracts to which patent in fee simple has been issued to individual Indians and which may still remain in Indian ownership or may have been disposed of to whites. Such lands are subject to taxation and sale and are in every sense private property.

3. *Ceded but unentered*.—Lands ceded by the tribe to the Federal Government for disposal by the General Land Office. Indian title will not be extinguished until homestead entry is approved and proceeds paid into the tribal fund.

4. *Trust allotments*.—Lands in homestead size tracts to which patents have been issued to individual Indians with restrictions as to alienation or encumbrance.

5. *Tribal*.—The undivided community-owned lands of the tribe. The extent of holdings under the various status classes in 1931 were as follows:

	<i>Acres</i>
Ceded and alienated.....	10, 775, 263
Alienated allotments.....	3, 897, 012
Total.....	14, 672, 275
Ceded but unentered.....	1, 812, 205
Trust allotments.....	13, 539, 641
Tribal lands.....	30, 051, 979
Total.....	45, 403, 825
Grand total.....	³³ 60, 076, 100

This highly involved and decentralized ownership of land, which for purposes of effective and efficient range management should be handled in large consolidated blocks, constitutes one of the most trying problems of Indian range administration.

INDIAN RIGHTS AND PRIVILEGES

In addition to the intricately involved land status, there are several other problems peculiar to the administration of Indian lands, all deriving from the premise that "the least government is the best government" and that the Indians are entitled to a wide discretionary latitude in the handling of their own property. Because of this policy, Indians have not been prevented from grazing semiwild and almost worthless ponies yearlong on seriously depleted spring ranges. The desire to encourage the Indians in the ownership of sheep and cattle to develop economic independence and habits of industry has resulted in the minimum of restrictions on overgrazing, poor distribution, and other bad range practices.

The importance of income from the grazing use of individual allotments has been a further serious source of difficulty in range administration. The right of each individual Indian to obtain the highest possible current income from his property and the implied responsibility of Indian Service employees to support this procedure tended for years toward inadequate control of stocking and overuse of the range. The consolidation of Indian allotments into range units and the application of the permit system, accomplished under the grazing regulations of June 4, 1931, have been of major importance in improving this situation.

WHEELER-HOWARD ACT

It is too early in the operation of the Wheeler-Howard Act (June 18, 1934)—the most notable recent legislation with respect to Indian affairs—to make a conclusive appraisal of its ultimate effect on Indian range lands. However, certain of its features are extremely important in connection with range-land management.

The explanatory title of the act indicated its scope:

To conserve and develop Indian lands and resources; to extend to Indians the right to form business and other organizations; to establish a credit system for Indians; to grant certain rights of home rule to Indians; to provide for vocational education for Indians; and for other purposes.

³³ This acreage includes all Indian lands in the United States and therefore does not agree with the total acreage in the western range area.

The first four sections of the act deal with land status and ownership and are directed toward restricting the further alienation of Indian land to the irreducible minimum consistent with proper inheritance procedure. This will operate toward the stabilization of the ownership of Indian land in its present status and, together with the authorization for consolidation and acquisition contained elsewhere in the act, should have a helpful influence in range conservation.

Section 6, in which range management is specifically mentioned, reads as follows:

The Secretary of the Interior is directed to make rules and regulations for the operation and management of Indian forestry units on the principle of sustained-yield management, to restrict the number of livestock grazed on Indian range units to the estimated carrying capacity of such ranges, and to promulgate such other rules and regulations as may be necessary to protect the range from deterioration, to prevent soil erosion, to assure full utilization of the range, and like purposes.

This section makes the protection of Indian range lands and the application of sustained-yield management a definite mandatory responsibility of the administrative organization, but, since in each case of serious overgrazing on Indian lands the stock is owned by the Indians themselves, a much more complex procedure is involved than the mere modification or cancelation of a grazing permit. In fact, it would seem to involve a modification of lifelong habits and customs and the substitution of some other means of procuring a livelihood for a large percentage of the Indian population in the Southwest. Social and economic development must go hand in hand with the application of the conservation features of the Wheeler-Howard Act. If so, in the ultimate application of these conservation features, the Indians themselves as well as the Indian ranges will be greatly benefited.

PROBLEMS

The variation from time to time in the social aims and objectives of Indian guardianship by the Federal Government, the peculiar desires and habits of the Indian himself, the complicated pattern of land status within the reservations, and the failure for a long time on the part of administrative agencies to recognize that conservation and sustained yield of the range resources are fundamental to the future social and economic development of the Indian have resulted in a variegated pattern of accomplishment in conservation of the Indian-range resources. There has been severe depletion of the range forage, especially in the Southwest. On the forested reservations of the Northwest where the forestry unit of the Indian Service assumed responsibility for the supervision of grazing activities prior to 1920, the ranges are in reasonably good condition. Finally in 1930 the supervision of all grazing activities on Indian lands was delegated to the forestry unit and a positive program of range conservation was started. The many problems have by no means been solved but sustained-yield management has now been initiated and further progress seems assured.

Among the more important problems still to be dealt with are: Further reduction in numbers of livestock on many of the reserva-

tions and especially in the Southwest; the development of more adequate range-management plans; the installation of needed range improvements, range reseeding, and control of soil erosion; insofar as possible, the readjustment of the complicated status of land ownership inside the reservations; and improving the knowledge and understanding on the part of the Indian of the importance of range conservation and how to accomplish it.

THE GRAZING DISTRICTS

Approximately 162 million acres of unreserved unappropriated public domain remained in the United States on June 30, 1934—practically all of it in the 11 Western States. This is the last “picked over” remnant of the once vast acreage of free public land, which except for 65 million acres now being organized for administration under the Grazing Act is a no man’s land so far as conservation and orderly use of its resources are concerned. In addition, there also were on June 30, 1934, approximately 29 million acres of other Federal land in withdrawals for reclamation, preservation of oil, oil shale, coal, and minerals, and for other special purposes which, so far as grazing is concerned, is in the same status as the remaining unreserved public domain. The grazable range area involved is approximately 60,567,000 acres in the grazing districts, 67,224,000 acres in the unreserved public domain, and 22,996,000 acres of other Federal lands. The forage resources on this land including that in grazing districts as shown in table 54 have been depleted approximately 66 percent as compared to virgin condition and the soil and watershed values have been greatly impaired. The use of the land for wildlife conservation has been greatly reduced. The lack of regulation has led to serious social and economic maladjustments.

Although the need for regulation to conserve and wisely use these resources has been recognized for many years and efforts to obtain action have been aggressively urged since late in the last century, nothing was done about it until recently. In June 1934 the Grazing Act was passed, but only after opposition which forced amendments that greatly lessened its value as an instrument for the solution of one of the Nation’s major conservation problems.

TABLE 54.—Degree of depletion of virgin range in plant types on the combined usable range area of grazing districts, unreserved public domain, and minor Federal reservations

Plant type	Total area ¹	Moderate depletion (0-25 percent)	Material depletion (26-50 percent)	Severe depletion (51-75 percent)	Extreme depletion (76-100 percent)	Average depletion
	1,000 acres	Percent	Percent	Percent	Percent	Percent
Tall grass.....	147	100				12
Short grass.....	12,925	6	44	48	2	49
Pacific bunchgrass.....	2,552		21	48	31	65
Semidesert grass.....	10,420	1	24	59	16	60
Sagebrush-grass.....	49,384	1	10	52	37	69
Southern desert shrub.....	7,954		17	62	21	64
Salt-desert shrub.....	32,657		10	43	47	72
Piñon-juniper.....	26,863	2	8	39	51	73
Woodland-chaparral.....	1,813		47	53		51
Open forests.....	6,074	11	26	49	14	54
Total or average.....	150,789	2	15	48	35	66

¹ Includes acres of usable range closed to grazing for various purposes.

FAVORABLE FEATURES OF THE GRAZING ACT

The title of the Grazing Act lists as its purposes:

To stop injury to the public grazing lands by preventing overgrazing and soil deterioration; to provide for their orderly use, improvement, and development; to stabilize the livestock industry dependent upon the public range; and for other purposes.

The Secretary of the Interior is authorized, in his discretion, to establish grazing districts, aggregating not to exceed 80 million acres, out of the vacant, unappropriated and unreserved lands of the continental United States, exclusive of Alaska. The objects of the grazing districts are stated to be "to regulate their occupancy and use, to preserve the land and its resources from destruction or unnecessary injury, to provide for the orderly use, improvement, and development of the range." The Secretary is directed to "make provision for the protection, administration, regulation and improvement of such grazing districts as may be created, * * *" and to "make such rules and regulations and establish such service, enter into such cooperative agreements, and do any and all things necessary" to accomplish the purposes of the act and to insure the objects of the grazing districts, and is authorized "to perform such work as may be necessary amply to protect and rehabilitate" the grazing districts. The Secretary is further directed to "specify from time to time the number of livestock that shall graze within a district and the seasons when a district shall be used for grazing" and to fix or determine reasonable fees for the use of the range.

It would appear to be clear from the foregoing provisions that the Secretary of the Interior has broad discretionary power to do whatever is necessary, subject to appropriations for such purposes, to perfect administrative machinery, establish necessary rules and regulations, construct range improvements, regulate the use, and do whatever else is necessary to stop injury from overgrazing and to conserve all the resources on the public lands set aside as grazing districts.

The act also provides for the exchange of State or privately owned land within a grazing district for public land on the basis of equal value. Thus opportunity is afforded to clear up situations where intermingled privately owned or State lands otherwise would complicate administration.

The grazing districts are closed to homestead entry except tracts which are classified by the Secretary of the Interior as more valuable for farm crops than for native forage plants. Supplemental to the Grazing Act, all of the remaining unreserved unappropriated public domain has been withdrawn from entry under the nonmineral land laws pending classification. Consequently, until the Executive withdrawal is modified, public-domain lands are no longer subject to disposal under the homestead laws.

SHORTCOMINGS OF THE GRAZING ACT

Accomplishment of the purposes and objects of the Grazing Act may be greatly hampered or even defeated by certain weaknesses in the law. The act contains several restrictive clauses; others are ambiguous or conflicting and will require interpretation in the courts before a clear understanding is possible. At least, until these clauses

are judicially construed, contentions and differences of opinion will handicap the making of administrative decisions and will impede, if not prevent, real accomplishment in conservation and use of the resources. Much will depend also upon the policies for administration which are adopted under the broad discretionary powers delegated by the act. A clause in the opening sentence, "pending its final disposal", weakens the structure of the whole act. It implies that administration is only temporary and discourages far-sighted aims and objectives and initiation of the kind of action essential to the proper protection and conservation of the resources. It appears to make clear that the intent of the act is to dispose of these lands in the reasonably near future. The whole history and experience with this land has been that it is unsuited to private ownership and should remain in the jurisdiction of some public agency financially and administratively qualified to cope with the problems of management.

The maximum of 80 million acres authorized to be included in grazing districts is only approximately one-half the public land needing attention. At best, therefore, the present problem is only half met.

RELATED RESOURCES NOT RECOGNIZED

No specific provision is made for the protection of watershed values in order to control the menacing erosion or reduce the serious floods which originate on this land, beyond that which may be accomplished by revegetation and improvement for grazing purposes, or for the development and use of the other resources—more especially game, wood, and recreation. On the other hand, the act is so explicit throughout with reference to use and development of the land for the grazing of livestock that there is bound to be strong and persistent contention that the act is designed wholly for the welfare of the livestock growers, or at least is so colored that great difficulty will be encountered in interpreting it otherwise. If the task involved no more than restoring the meager grazing resources, it might be argued that the land had better be abandoned without attempting conservation. But this land cannot be written off the books and discarded like a worn-out piece of machinery. Depletion has brought excessive run-off and water or wind erosion almost everywhere. Fully 50 percent of the usable range land comprises parts of watersheds or is otherwise so situated that floods and silt are destructive to power and irrigation development and to adjoining land, and are making increasingly difficult the maintenance of highways and railroads across this vast domain. The breeding, on depleted public domain range lands adjoining agricultural sections, of insects injurious to farm crops promises to become a serious problem unless the present host plants, which have come in as the result of overgrazing, are replaced. These various consequences extend to areas and values far beyond the limits of the land itself.

The grazing-district lands, in addition to producing forage for domestic livestock, afford other important possibilities of use. They constitute the natural feeding place or breeding grounds, or both, for various species of game animals and birds. Some areas support woodland or forests which are an important source of fuel and building material for local use. Still other parts have high potential

value for outdoor recreation and the human enjoyment of desert flora, geologic forms, and scenery.

In order to realize the maximum contribution to local communities and the general public welfare, there should be correlated use, protection, and development of all of the resources on the grazing districts so as to obtain the highest net benefit from all combined, in accordance with actual present and probable future needs. Perhaps this can be accomplished under the broad authority conferred upon the Secretary of the Interior.

LIMITATIONS ON TRANSFERS OF LAND FROM GRAZING DISTRICTS TO NATIONAL FORESTS

The act provides for the transfer of any lands within national forests chiefly valuable for grazing which can best be administered as grazing districts. There are several million acres of land now in national forests which perhaps might be administered under either the act of June 4, 1897, governing the national forests, or the Grazing Act of June 28, 1934. However, since the Grazing Act greatly restricts action to conserve and wisely use the resources of the land, certainly no good purpose could be served by placing in the grazing districts land now under national-forest status, which has been effectively and satisfactorily administered for a quarter of a century.

Moreover, the Grazing Act should have provided for the transfer of any lands in grazing districts or the open public domain which adjoin and form integral parts of timber bodies, watersheds, and range units largely within national forests.³⁴

There are approximately 26 million acres of forest range land in the unreserved public domain and grazing districts in the Western States which should be added to the national forests in order to simplify administration, and devote the lands to the purposes for which they are chiefly valuable. It would also be possible for users of a single economic unit, now divided under two Federal jurisdictions, to deal with a single administrative agency. This would still leave approximately 1,000,000 acres of isolated tracts of forest range land for administration under the Grazing Act.

LIBERAL SALE OR LEASE OF ISOLATED TRACTS OF PUBLIC LAND

Scattered practically throughout the more solid blocks of privately owned range land in the West are isolated tracts of public land of a few to several thousand acres in area, aggregating upward of 10 million acres or more, which cannot readily be administered as parts of grazing districts. Most of them are submarginal for private ownership, or title long since would have passed.

The Grazing Act provides for the leasing of such isolated or disconnected tracts or parcels of 640 acres or more in area to owners of contiguous lands, under such terms and conditions as the Secretary may prescribe. It also provides that such tracts, not exceeding 760 acres in area, may be sold at public auction when in the judgment of the Secretary of the Interior it is proper to do so. Still another provision in the act authorizes the sale of legal subdivisions of public land not exceeding 160 acres unsuited to cultivation, to own-

³⁴ Utah, South Dakota, and Nevada are the only States where, at present, national forests may be created or enlarged by Executive order.

ers of adjoining land regardless of whether the tract is or is not isolated or disconnected. These provisions in the act may be administered so as to safeguard the public interest. On the other hand, if administered in accordance with the past policies and traditions of land disposal in the United States, they may become an effective means of defeating the purposes of the Grazing Act, jeopardizing the public interest on several million acres of public land, besides adding to the present excessive burden of private ownership of range land.

Within the limits of the railroad land grants, for example, where the odd-numbered sections are alienated, the alternate sections, the large majority of which in many localities still belong to the Government, are isolated tracts within the meaning of the law. In Nevada the odd-numbered sections in a strip approximately 320 miles long and 40 miles wide were granted to a railroad company and most of the even-numbered sections still belong to the Government. If leased to the railroad companies, which are the owners of the contiguous land, it would be physically almost impossible to enforce requirements to protect the range and prevent overgrazing of the intermingled public land. The control would largely be in the hands of the present owners or lessees.

FUNCTIONS OF RANGE CURTAILED

The grazing-district land in the main is basically unfitted for development and use independent of lands in other forms of ownership or control. This public range is needed primarily to supplement tilled forage-crop lands and range lands in other forms of ownership and control to the end that satisfactory rounded-out operating units involving all classes of agricultural land will be achieved. Accomplishment of this aim is complicated by the highly unsocial and uneconomic land-use situation which has developed under the inadequate land-disposal policy of the past. Under the system of economic and physical competition which has existed on the open public domain, the more aggressive stockmen in numerous instances have been able to crowd out their weaker neighbors and to monopolize the watering holes and better areas of range.

For example, in one Western State having a large acreage of unregulated range, past practice has permitted the larger livestock interests to acquire from the State land and water which might have been used to better advantage in production of cultivated forage crops to supplement the public range. This land they have utilized chiefly for the inefficient production of wild hay and to control large areas of public range to the exclusion of diversified agriculture. In 1916 one writer (6) stated, "Instead of numerous small farms cultivated by their owners, we see great land holdings owned largely by corporations and managed in such a way as to create conditions unfavorable to the welfare of the laborers and the public." The situation has changed but little since that time. To bring about the needed adjustments in land use and ownership involves the application of sound forward-looking social and economic principles in the administration of the Grazing Act.

In this connection, with reference to the issuance of permits for the grazing of livestock, the act provides that:

Preference shall be given * * * to those within or near a district who are landowners engaged in the livestock business, bona-fide occupants or settlers, or owners of water or water rights, as may be necessary to permit the proper use of lands, water or water rights owned, occupied, or leased by them. * * *

To the extent that this clause provides for such an integration of public lands with other grazing and forage-crop lands of a locality as will result in the highest use of all the land, it specifies a highly desirable objective. However, to attach the grazing privilege to the land, water, or water rights in a manner to permit their "proper use" regardless of all other circumstances would result in dividing the available public-range resource and attaching it in proportional quantities to all of the owned land or water with which it might properly be used. To do so would perpetuate and enhance existing monopolies in land use which have been established in many instances by the stronger individuals taking advantage of their weaker neighbors.

Take, for example, a locality where neighboring small settlers and large-sized livestock outfits, each owning or leasing land and water in equal proportion to the number of livestock they own, all use in common a public range having insufficient grazing capacity properly to use all of the land and water owned or leased by them; the small operators under such conditions and under a possible interpretation of the law would be required to reduce their number of livestock in the same ratio as the large operators, regardless if to do so would impoverish the small operators; it would be impossible under such circumstances to impose proportionally heavier reductions on the larger outfits in favor of the small settlers in order that the latter might continue to maintain their standard of living from the land and livestock. In other words, the act appears to give preference to existing property rights rather than to human needs in the distribution of public benefits.

In Nevada where most of the springs and streams are held by the ownership of small tracts of privately owned land or under the livestock-water law of that State, this clause in the Grazing Act might be construed as granting to such holders the use of all the surrounding public range land that might be necessary to permit the proper use of the available water. In that event, the old practice of controlling large areas of public domain by the ownership of a few acres of land strategically located, would be confirmed by law.

The use of public range in connection with leased land or water, is theoretically commendable to the extent that it would help the small owner to enlarge his grazing preference and in that manner improve his standard of living. But this also is a double-edged sword. The larger resident operator or transient stockman frequently is the stronger competitor and higher bidder for lands offered for lease. Moreover leasing gives the absentee property owner benefits which more properly should be given to local residents who need them to maintain permanent homes in the locality where the public range is situated. Therefore, it appears not to be in the interest of improving local social conditions to give equal consideration to leased and owned land in distributing public-range privileges.

DANGER OF RANGE RIGHTS BECOMING ESTABLISHED

Several provisions of the Grazing Act contain language which might be construed as a grant to favorably situated stockmen of indefeasible rights and privileges in the use of forage and related resources on grazing-district lands, even though the exercise of these rights and privileges prevents an equitable allotment of such resources. For example, section 1 contains the following provision:

Nothing in this act shall be construed in any way to diminish, restrict, or impair any right which has been heretofore or may be hereafter initiated under existing law validly affecting the public lands, and which is maintained pursuant to such law except as otherwise expressly provided in this act * * *

At the end of section 3 it is further provided that—

So far as consistent with the purposes and provisions of this act, grazing privileges recognized and acknowledged shall be adequately safeguarded, but the creation of the grazing district or the issuance of a permit pursuant to the provisions of this act shall not create any right, title, interest, or estate in or to the lands.

While persons hitherto using the range involved did so under a sort of implied license without acquiring a vested right thereto, the provisions of the act quoted above, although aimed to deny the creation of right in the land itself, imply a right of user amounting to a property right which the Secretary of the Interior cannot disturb. Should it be so construed, his administrative control of such land as elsewhere provided in the act would be seriously hampered, if not defeated, and he would therefore be compelled to suffer a continuation of present conditions regardless of what the public interest might require in bringing about properly regulated management.

There can be no doubt as to the intent of that part of section 3 reading as follows:

* * * except that no permittee complying with the rules and regulations laid down by the Secretary of the Interior shall be denied the renewal of such permit, if such denial will impair the value of the grazing unit of the permittee, when such unit is pledged as security for any bona-fide loan.

Obviously the limitation placed on the powers of the Secretary of the Interior by this provision may be used by permittees materially to restrict, if not wholly to defeat, adjustments in range use that are necessary if grazing privileges are to be equitably distributed in the interest of home and community development or for the purpose of improving and protecting the range. There are very few livestock or ranch properties which do not continuously constitute security for a loan, the value of which would be impaired in varying degrees by denying the owner a renewal in full of his permit. This provision discriminates against the owner who happens to be free of debt when he applies for a renewal and—most important—makes it possible for any permittee to continue his exclusive use of the range and obtain other undue advantages by simply using his livestock and ranch property as security for a loan, the amount of such loan apparently being immaterial. In short this provision enables permittees very easily to perpetuate their monopoly regardless of how adversely such perpetuation affects the interests of the community and the general public.

The dangers involved in the establishment of rights in public resources is illustrated by the accumulated experience of Europe (27). There the public interest has suffered in three ways: Large

areas of forest, both public and private, have been needlessly destroyed or severely damaged; the progress of agriculture has been held back by the perpetuation of uneconomical land use and stock-raising methods; and the rights themselves have been the source of much wasteful litigation and ill feeling. Despite the struggle going back over several centuries to extinguish these rights, many are still in existence. About the only way the situation can be met is by outright purchase and then only where the holder agrees to the bargain, except when there is cause to exercise the right of eminent domain. There is grave danger that the safeguarding of privileges to use public domain as set forth in the Grazing Act at the present time, if allowed to remain will eventually become more securely fixed by right of long usage.

In the United States, the fixing of rights to use the range is seen to have highly undesirable features at the present moment, but it may become a more serious menace in the future. Vested rights in Europe originated when forests were abundant and pasturage was scarce, and under such circumstances damage to the forest was of less import. With time the situation was reversed and grazing rights have become a real handicap to meeting the needs for timber. A similar reversal of conditions may develop in this country. As the needs for protection and use of the land for watershed purposes, game, and recreation multiply, the fixing of rights on the grazing districts will seriously interfere with these purposes. Quite as important also is the lessening by fixing of rights of the opportunity to correct the uneconomical land use which has grown up in the West.

COMPLICATIONS WITH STATE LAWS

If the States fully exercise the jurisdiction expressly conferred on them by two provisions of the act, the Federal Government may find it impossible to administer grazing districts in an effective manner. The first of these provisions is found in section 1 and provides that nothing in the act shall be construed in any way "as limiting or restricting the power or authority of any State as to matters within its jurisdiction." The other is contained in section 16, which reads as follows:

SEC. 16. Nothing in this Act shall be construed as restricting the respective States from enforcing any and all statutes enacted for police regulation, nor shall the police power of the respective States be, by this Act, impaired or restricted, and all laws heretofore enacted by the respective States or any thereof, or that may hereafter be enacted as regards public health or public welfare, shall at all times be in full force and effect: *Provided, however,* That nothing in this section shall be construed as limiting or restricting the power and authority of the United States.

These two provisions are ambiguous and might be construed to mean that existing and future State laws will apply to grazing districts established under the Grazing Act and will prevail over any conflicting or inconsistent regulation of the Secretary of the Interior. If so construed, regulatory control over these districts thus in large measure would be turned over to the several States and the authority of the Secretary of the Interior would be so limited that he could not take any action with respect to the grazing districts

which conflicts with State law, particularly if the proviso at the end of section 16 is strictly construed. However, since the legislative intent reflected in this section and in the last sentence of section 3 is not clear, it is not yet possible to determine accurately how such provisions will be interpreted. Therein lies one of the major difficulties of the act. Many parts are so ambiguous and so conflicting that controversies are bound to occur until such time as the act has had judicial interpretation.

RANGE ADMINISTRATION BY STOCKMEN

Obviously much will depend upon the kind of administration developed under the broad provisions of the act with respect to meeting the needs both of those dependent upon the range and the broader public interest. Section 9 stipulates that the Secretary of the Interior "shall provide, by suitable rules and regulations, for cooperation with local associations of stockmen, State land officials, and official State agencies engaged in conservation or propagation of wildlife interested in the use of the grazing district." This provision is a favorable feature, resembling that adopted under rules and regulations applying to the administration of grazing on the national forests, in that it recognizes the desirability of giving the user an advisory voice in local affairs and induces voluntary interest in the range. Whether or not it should be made the main instrument of administration seems doubtful.

Rules have been adopted by the Department of the Interior specifying the procedure under this clause which provide for the selection of stockmen representatives³⁵ for all grazing districts and for wildlife and recreational representatives in one of the western States, New Mexico.³⁶ In commenting on the procedure for selecting stockmen representatives, the Annual Report of the Secretary of the Interior for the fiscal year ending June 30, 1935 (p. 16), states as follows:

* * * the services of local persons familiar with the range problems will be secured by a special election of district advisors from among local stockmen. * * * By this means the practical local viewpoint will be available at all times in the administration of the law. * * * They will take the regular oath of office of a Federal official and will be the local governing agency as to all matters of range regulatory nature concerning their particular district. The Interior Department will exercise necessary supervision and provide basic technical criteria for conservation of natural resources.

This no doubt is an indication of the intended form of administration. It places the large balance of power in the hands of the livestock interests and leaves to the Government representatives the mere exercise of supervision and to "provide basic technical criteria" for use by the stockmen.

To grant to the stockmen the major controlling power in the administration of the grazing districts implies that they will exercise the necessary self-restraint and denial in immediate use and misuse for the sake of the permanence of the range, something rarely

³⁵ United States Department of the Interior, Division of Grazing. Rules Providing for Special Elections for District Advisors to Assist in Management of Grazing Districts. U. S. Dept. Int., Dept. Grazing Circ. 1, 5 pp. 1935. [Multigraphed.]

³⁶ United States Department of the Interior, Division of Grazing. Special Rules for Grazing Districts in New Mexico. U. S. Dept. Int., Dept. Grazing Circ. 3, 2 pp. 1935. [Multigraphed.]

exercised on their own lands. Conservation of the resources requires a large fund of technical knowledge of a difficult problem and cash outlays to restore productivity. It involves a high degree of public spirit to forego range use and the denial of personal profit in order to realize on public values in watershed protection and game conservation, which may be considered by the individual stockman to be of little if any direct benefit to him. There must be cooperativeness in an unusually high degree to prevent individuals holding positions of power from using them to their own immediate advantage. All these are the very antithesis of the doctrine of laissez faire which has resulted in the present condition, not only of the grazing-district range itself but of the bulk of the area of privately owned and State lands throughout the West.

What is needed, in addition to the cooperation of all classes of users and full opportunity to express their voice in an advisory capacity, is a well-planned, closely knit, positive administration with adequate technical skill which will give full consideration to the broader community, State, and interstate public interest as well as to the local livestock industry.

The problem of stopping damage and restoring the grazing capacity of the grazing districts is highly difficult and technical, because of the serious depletion, adverse soil and climatic conditions, and low productivity. It will involve heavy reductions in the numbers of livestock grazed and management from more than a short-sighted viewpoint. Other essentials are the protection of watersheds, conservation of game, and the development of the use of the resources other than livestock forage. Still another of the big tasks is to bring about the proper integration of use of the grazing-district land with other agricultural lands both inside and adjoining the grazing district, and to place the capacity of the land to support dependent populations ahead of large profits for a relatively few; problems having broad public aspects. It is doubtful whether these functions will be exercised under a system of administration of self-regulation by the stockmen who use the range.

Finally the Grazing Act sets up an agency in the Department of the Interior to deal with agricultural problems, whereas practically all other agricultural functions of the Federal Government, including administration of the national-forest ranges, are grouped in the Department of Agriculture. Another problem therefore is that of how best to unify responsibility for range administration in a single department of the Government.

CONSERVATION ON PRIVATELY OWNED RANGE

Approximately 51 percent of all western range lands are in private ownership. According to estimates based on the best available information as shown in table 54a only 12 percent of this land has been maintained or restored to within 25 percent of its virgin condition. The least depletion is found in the tall-grass and open-forest types; only approximately 5 percent of the total area of all the other types is in the moderate depletion class. Among the factors which have contributed to depletion, as pointed out in earlier sections of this report, are excessive stocking or other rule-of-thumb management, lack of legislation that permitted acquisition of land in units

best suited to proper use of land for range-livestock production, unsound financing, high interest, heavy taxation, poor marketing facilities, competition that compelled excessive ownership of land and inflation of land values, and other conditions some of which the private landowner has been unable to control. The privately owned range lands which are in the better condition class today are of especial interest in developing a program for the solution of western range problems.

TABLE 54a. Degree of depletion of virgin range by plant types on privately owned lands

Plant type	Area	Proportion of total ownership				Average degree of depletion
		Moderate depletion (0-25 per cent)	Material depletion (26-50 per cent)	Severe depletion (51-75 per cent)	Extreme depletion (76-100 per cent)	
	Thousand acres	Percent	Percent	Percent	Percent	Percent
Tall grass.....	17, 271	72	24	0	4	22
Short grass.....	148, 144	8	47	28	17	51
Pacific bunchgrass.....	35, 913	8	38	50	4	50
Semidesert grass.....	48, 425	3	30	63	4	54
Sagebrush-grass.....	34, 791	3	6	46	45	71
Southern desert shrub.....	10, 643	0	22	52	26	63
Salt-desert shrub.....	5, 251	1	3	45	51	74
Piñon-juniper.....	20, 900	8	30	42	20	56
Woodland-chaparral.....	10, 640	1	45	52	2	51
Open forest.....	43, 568	28	46	21	5	38
All types.....	375, 546	12	37	36	15	51

The privately owned range lands which are exceptions to the more prevalent condition of serious depletion may be classified into four groups. These are (1) isolated cases of individual ranges in good condition within areas where, because of the prevalence of unfavorable natural factors, the general situation is one of depletion; (2) ranches or groups of ranches within regions where natural and other factors are more or less favorable, as in parts of the Great Plains; (3) ranges in areas where natural conditions practically dictate the continuous practice of range-conservation measures, as in the sand-hills region of Nebraska, and (4) on privately owned lands in and adjacent to the national forests. These privately owned ranch lands in good condition have never received the thorough study they require in order to set forth with finality the contributing factors. This analysis, therefore, must be based on general knowledge and information. However, the results from a few examples are indicative.

WEST OF THE GREAT PLAINS

With few exceptions natural conditions west of the Great Plains render difficult the conservation of the range. The rainfall is low and often poorly distributed and droughts are frequent. Few of the native plant species or types are highly resistant to grazing and the grazing capacity is naturally low. The soil on extensive areas is easily damaged by trampling. The composition and char-

acter of the vegetation is such that damage to the range may occur long before it forces a reduction in the number of stock being grazed. The lack of control on the extensive open public domain has often caused pressure to overuse privately owned land. These are only a few of the adverse factors with which the private owner has had to deal. In spite of this general situation there are scattered ranch lands in good condition where the owners have successfully conserved the range.

Two or three range units on Kolob Mountain in southwestern Utah, for example, have been maintained in good condition as contrasted with severely depleted holdings adjoining them. The owners of the good ranges purchased their lands a good many years ago at relatively low prices and thus have escaped excessive interest charges on land indebtedness. They have stocked their ranges conservatively and the original cover of snowberry, mountain brome-grass, weeds, and other plants carry sheep through the summer season at the rate of two-thirds of an acre for each animal for each month. This is approximately a one-third higher grazing capacity than on some of the adjoining ranges, which have been overstocked. In the whole State of Utah there are perhaps a dozen such well-cared-for private ranges.

In Idaho at least one wool growers' association has done a creditable job of forage maintenance on most of its spring-fall range, a large part of which is leased from the State. The association has adopted rules limiting the number of stock to be grazed and the seasons of use, and practices deferred and rotation grazing. The enterprise has been handled under the guidance of one or two progressive stockmen who have foreseen the value of sustained-yield range management. The net result of these factors is that the range is far above average in condition.

In California a number of ranches are used continuously for range—some for over 50 years—on the basis of sustained yield of forage. Seasonal deferred and rotation grazing has been practiced. Distribution of stock has been improved by fencing and water developments. One ranch in Marin County once badly depleted has been brought virtually to its pristine condition. A strict type of deferred grazing was followed. The unit was well balanced, and the operator devoted all of his time to his ranching business.

In Humboldt County, Calif., a 40,000-acre ranch, used for livestock production for 50 years, still supports a maximum stand of California oatgrass. The area is an economic and balanced unit. The operator has been careful not to overgraze and has practiced deferred grazing. He has not expanded speculatively.

An old Spanish land grant in Colorado is now being managed under deferred and rotation methods of grazing, and stocked conservatively so as to restore the original carrying capacity that was seriously depleted by former lessees.

The reasons for the individual cases of privately owned ranges in good condition west of the Great Plains, which represent probably less than 5 percent of all range lands in private ownership in that area exclusive of those in and adjacent to the national forests, may be summarized as follows: (1) Reasonable cost of range land, either purchase cost or rental; (2) well-rounded-out operating units;

(3) close personal attention to use of the range; (4) the application of some of the fundamental principles of range management; and, (5) most important of all, an appreciation that conservative use of the range to maintain yield of forage is the foundation to sustained livestock production.

THE GREAT PLAINS

In the Great Plains short-grass type naturally favorable factors have contributed much to the 8 percent of privately owned range in that type that is in good condition. Within this region rainfall is 15 to 20 inches and a relatively larger proportion of it falls during the growing season than further west. The dominant vegetation over large areas is grama, buffalo, western wheatgrass, sedges, and other sod-forming species which are relatively resistant to grazing, trampling, and drought, and recover quickly from set-backs if given reasonable opportunity, as compared with the bunch grasses and other species which occur in many western range plant types. The land, on the whole, is flat to rolling, and watering places may be developed relatively cheaply—factors which favor good distribution of livestock on the range. In many localities these favorable factors are offset in some degree by light soils which are low in productivity or are easily damaged by trampling. Prudent management also has contributed to the ranges which are in good condition in the Plains region, but on the whole the more favorable natural factors have been the dominating influence.

Sarvis (119) has found in his work at the northern Great Plains field station near Mandan, N. Dak., that under a very heavy stocking of one steer to 5 acres as compared to a proper stocking of one steer to 7 acres during the same grazing season the decline in range takes place very slowly and that after 19 years the grazing capacity had declined only 46 percent on the overgrazed range. His studies show that due to the recuperative capacity of the grasses almost complete recovery took place where all of the grasses had not been destroyed, in 1 or 2 years of average or better rainfall with complete rest or moderate to light use. He reported very marked improvement during 1935 on extensive areas of privately owned land in western North and South Dakota following the almost complete removal of livestock on account of the 1934 drought.

Sarvis' studies and Hurtt's (76) in Montana both show that cattle do not make as good gains on overstocked as compared to properly stocked range. In other words, overuse of the range in the Great Plains is quickly reflected in the condition of livestock—a reversal of the situation on many range lands further west—which encourages more conservative stocking when the aim is to obtain maximum weights of animals at marketing time.

The Pumpkin Creek-Mizpah grazing district in Montana is an example of the improvement in range lands obtainable where favorable natural conditions are coupled with the practice of range management by progressive stockmen. Although conditions are not as favorable here, as on many other parts of the Great Plains, the combination of good rainfall distribution, soil, and character of vegetation is better for maintenance of the range than where bunch grass

is the chief forage. The present association range of approximately 100,000 acres grew out of a desire of the users of the area to solve an almost impossible land-ownership pattern which had grown out of the past land policy and to stabilize the cost of range feed.

Forty-one percent of the area was railroad grant lands, 25 percent open public domain, 6 percent State, and 28 percent privately owned land in small tracts. The major object of the legislation establishing the grazing district was to coordinate all of these ownerships into an integral unit of range land. The key to control was the public domain, which under the permissive policy of the Government was open to use by all and subject to regulation by none. The 75 percent of non-Federal lands represented most of the grazing capacity within the area.

The act authorizing the withdrawal of the public domain contained an important section providing for cooperation between all interested agencies and landowners. Coordination was effected through organization of the users into an association which leased the railroad land, exchanged the State land for Government land, leased or offered to lease the small privately owned tracts, and purchased the tax-delinquent lands. The entire acreage was pooled so that it could be managed and administered as a community range.

Regulations for the administration and government of the area, adapted from those in effect on the national forest ranges, were framed by the association and approved by the Secretary of the Interior. They included the permit system, fees based upon the established rate per head as determined by the annual expenses of the association, allocation of use according to dependence of individual owners upon the range in order properly to utilize their owned range and crop land. An inventory of the range resources following Forest Service methods was made for use as a base in determining grazing capacity and a plan of management.

The plan of local administration and management has operated well, and persons familiar with the area report that the range has improved. Thus the naturally favorable factors, solution of an unsatisfactory mosaic of land ownership, the desire of a small group of stockmen with common interests to bind themselves together, and the adoption of simple principles of range movement applicable to the prevailing conditions have resulted in benefits to the whole community.

In the flint hills of Kansas and Osage hills of Oklahoma naturally favorable factors and the type of livestock production have resulted in the maintenance of the range. The 30 inches of rainfall and a soil formed largely from limestone, but too shallow to till, produces high forage yields. Rehabilitation in this type according to Dr. A. E. Aldous, of the Kansas Agricultural College, will take place under 2 years of rest and 2 years of moderate use if a small number of the original plants remain to start with. Moreover, much of the range is used for fattening steers on pasture which discourages excessive stocking because to do so results in poor gains in weight by the animals.

In Texas are found a number of large privately owned ranches, some of them in excess of 100,000 acres in area, have been improved by wells, reservoirs, and fences, and divided into seasonal pastures

and moderately stocked so that plentiful pasturage is supplied except in the severe drought years.

THE SAND HILLS OF NEBRASKA

The sand hills of Nebraska represent a unique situation because natural conditions have virtually dictated a policy of conservative use which has resulted in range preservation. Other factors have contributed, but they are secondary. This is a compact area of 11,520,000 acres on a low rolling sand-dune formation which has become fixed by the tall-grass cover located in the northwestern part of the State. The soil is a fine sand, subject to severe wind erosion when not protected by vegetation (72).

Early attempts at crop farming on 640-acre homesteads under the Kinkaid Act failed in this section. The fine sandy soil, once the vegetative cover was removed, became moving sand dunes. Taught by bitter experience the survivors consolidated their holdings into larger units, abandoned cropping practices, fenced their lands, and engaged in livestock production, based upon using about 80 percent of the land for pasture, 18 percent for native hay meadows, and less than 2 percent for crops.

Despite the delicate balance in which nature holds these lands, the climate, the native vegetation, and the absorptive capacity of the soil favor rehabilitation after depletion. Seventy-six to 80 percent of the 16 to 21 inches of precipitation falls between April and September and are readily absorbed. Forage yields are reduced by drought, but complete failures in forage production are unknown.

The soil dictates forcibly the methods of management which will maintain a plant cover. Overgrazing or prairie fires expose the sand to wind action and cause rejuvenation of blow-outs. Extreme care must be exercised to prevent trailing or undue concentration of livestock at water holes or wells because the depletion under abuse is rapid and conclusive. The one essential that must be observed is the maintenance of a covering of vegetation to prevent wind erosion.

Other factors have been helpful. The production of grass-fat beef or of fat feeders that may be finished on corn has encouraged light stocking to insure the best gains. Costs of production have been kept low enough to avoid pressure on the range. Favorable location and transportation facilities result in a short haul to market and opportunity to take advantage of the higher markets. However, conservative range use is the principal factor accountable for a restoration on privately owned land comparing favorably with that on the Nebraska National Forest, where the grazing capacity has been built up 55 percent since 1911.

PRIVATELY OWNED RANGE LANDS IN AND ADJACENT TO NATIONAL FORESTS

National-forest administration has had a profound influence on a large proportion of the privately owned range lands in good condition in the open-forest type (table 54a). Much of this land lies in and adjacent to the national forests. There are approximately 10.5 million acres of alienated grazing land intermingled with Federal land within the exterior boundaries of the national forests. The great bulk of this is privately owned land, the remainder being in

State or other public ownership. A far greater acreage of privately owned land in the open-forest type lies adjacent to the national forests.

Management of 3,677,000 acres of the alienated land inside the public forest boundaries is waived to the Forest Service. A still greater acreage, both inside and adjacent, is handled under the "on and off" permit system, the private land merely being handled as part of forest-range units. This has resulted in the privately owned lands being managed practically as national-forest range.

FACTORS WHICH HAVE FAVORED RANGE CONSERVATION

The best available estimates indicate that only 12 percent of the privately owned range land in the western United States have been maintained in good condition. These lands (see table 54a) are found chiefly in the sand-hills region of the tall-grass type in Nebraska, and in the open-forest-range type within and adjacent to the national forests of the West. In the short-grass type in the Great Plains, approximately 8 percent of the privately owned land is in good condition, and throughout the remainder of the West are found a few scattered tracts.

Natural favorable factors, such as better-than-average growing conditions, plant species which are resistant to grazing and have high recuperative capacity, such as the sod-forming species in the Great Plains, a firm soil, good grazing capacity, and conditions which favor good distribution of livestock on the range have played an important role in maintaining many of the private ranges in good condition. Still other contributing factors which have favored range preservation are low purchase cost and freedom from exclusive interest charges on land, low-cost public range in connection with privately owned range, good business management, well-rounded-out operating units, favorable location with regard to markets, and special-use range, such as that for grass fattening of livestock. That these natural and economic factors have contributed materially to the avoidance of range depletion is not to be minimized. However, the fact cannot be overlooked that there are, or at least were before range depletion occurred, a far greater number of privately owned or controlled range units on which most if not all of these factors are favorable than there are such units upon which the range has been maintained in good condition. Furthermore, there are units where, in spite of many of these factors being unfavorable, range depletion has not occurred.

To deliberate efforts to so use the range that the grazing capacity will be sustained must be credited the greatest measure of range maintenance on privately owned lands. There are individual owners who have learned from experience, as in the Nebraska sand hills, or for other reasons have come to realize that their range land is not an inexhaustible mine but that it must receive proper consideration in use if it is to continue to be a source of forage for sustaining livestock production. These owners have practiced conservative grazing and applied simple range-management practices in order to maintain their basic resource. There is no other single range region where range-livestock production is on as sound a basis as in the sand hills of Nebraska, where stern necessity early taught stockmen that conservative grazing pays.

THE ADMINISTRATION OF PUBLIC RANGE LANDS

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There are two broad classes of range land in the western United States the ownership and management of which are a public function. In the first class, typified by the national forests, are lands representing special values of high public interest, such as timber growing and mountain headwaters of important streams. Included in this class are related intermingled areas, usable chiefly for grazing, wildlife, and recreation or, because of location and topographic unity, inseparable for the purposes of administration. All of these intermingled lands in Federal ownership are recognized by law and usage as being of national-forest character.

In the second class are the range lands of little or no utility for forest growth and of minor importance as a source of stream flow, often with forage values so low or so impaired as to be submarginal for private ownership, requiring protection against erosion and floods, and demanding conservation of the grazing, wildlife, recreational, and other resources. Broadly speaking, this class includes the semiarid or arid plains, the plateaus and minor interspersed mountains and valleys, and the low quality dry-farm lands. Federally owned lands in this category are recognized as being of a character suitable for administration as grazing districts.

In addition, several States, numerous counties, and some of the municipalities in the West own more or less range land of the two classes mentioned above. The Federal Government as guardian of the Indians also has primary responsibility for the management of Indian range lands. The acreage and present condition of the Federal, Indian, State, and other publicly owned range lands are shown in table 73.

TABLE 73.—*The present acreage and grazing capacity of public and Indian range lands in the Western States*

Ownership and form of management	Gross area	Available public range	Degree of depletion of virgin grazing capacity	Estimated present grazing capacity
	<i>Acres</i>	<i>Acres</i>	<i>Percent</i>	<i>Acres per animal month</i>
Grazing-district lands:				
Grazing districts.....	65, 523, 429	60, 567, 298	} 67	-----
Unreserved public domain.....	96, 664, 752	67, 224, 255		-----
Other.....	29, 178, 344	21, 598, 875	63	-----
Total.....	191, 366, 525	149, 390, 428	-----	12. 05
National forest.....	133, 874, 972	82, 538, 109	30	7. 23
Total Federal.....	325, 241, 497	231, 928, 537	-----	-----
State.....	65, 397, 692	58, 203, 357	-----	-----
County and municipal.....	8, 475, 950	6, 880, 575	-----	-----
Total.....	73, 873, 642	65. 083, 932	49	5. 66
Total public range.....	399, 115, 139	297, 012, 469	-----	-----
Indian lands.....	51, 045, 904	48, 390, 979	51	8. 17
Total for public management.....	450, 161, 043	345, 403, 448	-----	-----

It is estimated that there is approximately 125 million acres of primarily low quality alienated range and crop land, including abandoned dry farms, which, as pointed out previously, is undoubtedly destined for some form of public ownership. A considerable share of this land may automatically revert to State or county on account of tax delinquency; a smaller part consists of lands, title to which will revert to State ownership on account of foreclosure on loans made from State trust funds; and a third portion should be acquired by outright public purchase or gift. Whether or not the 125 million acres is the correct estimate of such lands, and regardless of the form of public ownership in which it will ultimately rest, it seems quite evident that the acreages shown in table 73 will eventually be increased by a considerable amount and the task of public-range management will be increased accordingly.

Practically all of the public lands except the national forests and Indian lands have been administered with far too little regard for the perpetuation of yield of resources. This viewpoint still governs in the case of most State lands and only recently has it been modified with respect to a part of the open public domain. It is becoming more and more evident that it is time to undertake a program of management of all public land if it is to be made to contribute a fair share to the support of society.

NATIONAL FORESTS AND GRAZING-DISTRICT LANDS ⁴³

The administration of the federally owned range lands should be of a character that will restore and maintain the range forage and other values, protect the soil, promote favorable conditions of stream flow, afford the highest sustained yield of all resources consistent with the broader purposes for which the lands are held in public ownership, and best integrate the use of the resources with the use of other lands in the development of a sound agricultural program for the Western States. Such an administration involves:

(1) Correlation in use of public lands to obtain the highest net benefits from all the resources combined.

(2) Skillful management to properly protect, develop, and utilize these resources.

(3) Integration of the public-range resources with related crop and other private and public-range land to secure the highest use from all of the land.

(4) Affording the maximum opportunity practicable to home builders who are entitled to use the range.

(5) Readjustment of land ownerships and use where needed to facilitate economical and efficient management and administration of public-range lands.

(6) A system of administration designed to deal with local problems in accordance with local conditions insofar as is consistent with the protection of the public interest.

Policies have long since been adopted and an administrative organization established in the Department of Agriculture to implement these aims and objectives on the national forests under the

⁴³ The term "grazing-district lands" is here used to include the group shown in table 73, made up of existing grazing districts, unreserved public domain, and grazing lands in those minor reservations classed as "other Federal."

broad authority conferred by the act of June 4, 1897. Administration has been a going concern for 30 years and during that time depletion has been checked and the range has improved an average of about 19 percent. The resources have been made available for public use in an orderly manner. The chief task of the future is to continue the present program with such adjustments as are necessary to solve existing problems and meet the demands of a sound agricultural economy.

The grazing districts are administered subject to the act of June 28, 1934. This act confers broad authority on the Secretary of the Interior but endeavors to write into law specifications for administration. Many of these specifications are in accordance with the aims and objectives sought, but, as pointed out earlier in this report (pp. 286-294), certain provisions were written into the act which may offset many of its favorable features. Among its outstanding defects is the limitation of management to 80 million acres, instead of including the whole 149.4 million acres of usable range suitable for administration as shown in table 73.

The problems confronting a real and effective administration and management of the grazing districts are formidable. The productivity of much of the land is normally low because of adverse climatic conditions. Long neglected, these federally owned range lands are now in bad shape. Grazing capacity on the usable area has been depleted to less than 35 percent of virgin condition. Depletion has brought excessive run-off and water or wind erosion of serious proportions almost everywhere. Wildlife resources have been greatly diminished. Communities have suffered because of the uneconomic use of the land.

The solution of these problems exhibits two major phases. The first is a definite and positive plan for restoration and wise use of the plant cover for watershed and soil protection and the production of forage for domestic livestock and game; and second, the integration of these lands and their resources with related agricultural lands of the West.

MULTIPLE USE OF RESOURCES

The soundness of the policy of devoting all the land "to its most productive use for the permanent good of the whole people" and not for the exclusive benefit of special groups or industries, as pointed out earlier, has been proved on the national forests. While grazing of domestic livestock is recognized as a major use of range land it is important that other resources be given adequate consideration.

The high degree of correlation necessary to obtain effective conservation and use of the associated resources on the land emphasizes the need for territorial rather than functional jurisdiction in administration of range land. The expert services of other agencies should be used as needed, but in order to accomplish the necessary correlation and to keep down the cost of administration, a single agency must retain responsibility on a given body of land. Division of responsibility according to function on the same land leads to confusion and unnecessary duplication of expenditures.

THE NATIONAL FORESTS

The multiple-use principle—including timber production, watershed protection, grazing, wildlife propagation, recreation, and other uses—has been adopted on the national forests and with regard to grazing and water power, which are not mentioned specifically in the organic legislation, has been sustained by the highest court.

Adjustments have been made from time to time on the national forests to meet the requirements of multiple use, and more will be required in the future. One of the essentials in achieving highest use of the land is to maintain sufficient flexibility to meet justifiable new demands as they arise.

Extensive areas exist where the land could well support more game, and there are others where, owing to the operation of State laws, there is overpopulation of game at the present time. These adjustments on the whole will not involve any net reductions in livestock use for the total range area but may be provided for by increased forage production, provided adequate range management is applied.

Watershed protection, timber production, and recreational needs on the national forests, on the whole, also may be met largely by local adjustments and improvement in grazing capacity. Commercial timber production plays a part on about 43 million acres of national-forest ranges, and an additional 22 million acres of other forest-range areas have important cordwood, fence post, watershed protection, and other values. Nearly 94 percent of the national-forest range is of importance in watershed protection. This involves 79 million acres of high water yield. Material or severe erosion is still occurring on 20.4 million acres which is contributing silt to major streams. It is estimated in the light of present information that approximately 336,000 acres of this critical area may need to be permanently closed to grazing for watershed protection. This is, however, only about 0.4 percent of the present usable range area on the national forests or 0.5 percent of the present grazing capacity.

GRAZING-DISTRICT LANDS

The grazing-district lands, besides producing forage for livestock grazing, have other values including watersheds, some timber, woodlands, game, and special outdoor recreation. As in the case of the national forests, it will be possible to realize on these values by proper correlation of use and the application of sound range management, although certain critical areas will require special consideration. The Grazing Act, however, is so colored by specific recognition of use by domestic livestock that unless the Act is amended specifically to provide for multiple use this feature of administration may be neglected.

On approximately 22 million acres forest growth must be considered. Still larger areas are important for wildlife, especially winter range.

The main sources of stream flow, because of higher precipitation and accumulation of snow during the winter, are largely within the national forests. However, the lower, more arid grazing-district

lands, which have not been protected, are the source of frequent disastrous floods and excessive silt, which enter the streams after they leave the national forests.

Range rehabilitation will provide much of the necessary protection on the 98 percent of the watershed area that is eroding more or less seriously. There are conditions, however, where lighter grazing than the range alone may require will be necessary. Of the total critical area, of which 74.5 million acres is eroding severely, it is estimated that 4,338,000 acres should be closed to grazing for watershed protection. The total closures amount to about 2.9 percent of the total range area.

The policy in allotting privileges to graze the range should be kept sufficiently flexible to permit adjustments as new needs arise for watershed protection, game production, or other use.

In addition to what may be accomplished by regulated use or closure, special erosion-control work is needed on a large area of the grazing-district lands. It is difficult if not impossible at this stage to estimate the acreage that might successfully be treated. Methods and practices are being developed by research and sufficient progress has been made to indicate that such work has a place in the range program, but until these studies have determined the practical and economical limits of application, it is not possible to make a reliable estimate of what the program should be.

RANGE MANAGEMENT

Range management, as here used, has to do with determining the proper grazing capacity, season of use, class of livestock, grazing systems to revegetate and maintain the range, handling of livestock on the range, the location and construction of improvements to facilitate best use of range, reseeding, game management, and all related activities necessary to attain the highest use consistent with the protection and sustained yield of all the resources. In short, it is a job of applied biology.

Conservation and protection of the resources may be achieved with little skill or efficiency merely by restricting use. To do so, however, would deny a dependent population of the use of the resources otherwise available to them. The more efficient method is to apply the knowledge and skill which will result in the highest yield of resources consistent with their perpetuation. This should be the aim in the management of public range.

THE NATIONAL FORESTS

The major steps in range management in the national forests, including adjustments in numbers of livestock and seasons of use to permit rehabilitation and perpetuation of the forage resources, have been completed. Grazing capacity, however, is not static. As range conditions improve, increased use may be possible in some places or further restrictions may be necessary in others on account of new demands for other uses, or to correct local overgrazing. The present stocking of the range is 12.2 million animal months or at the rate of 6.76 acres for each animal month. At the moment adjustments are needed on local areas aggregating approximately 20 percent of

the used range area on the national forests to repair damage incurred by the recent drought and postponed reduction of livestock during the depression. The present grazing capacity is at the rate of 7.2 acres per animal month. The aggregate reduction needed amounts to approximately 795,000 animal months or 6.5 percent of the present total grazing use by domestic livestock. Seasonal use should be corrected on the 12 percent of the range not now in proper adjustment. These immediate adjustments should be completed within the next 5 years.

It is estimated that, when restored to such productive capacity as as may be developed within the next 50 years, the national-forest ranges may be expected to become capable of supporting livestock at the rate of 6 acres per animal month or 13.7 million animal months per annum—an increase of approximately 20 percent over the present grazing capacity. Most of the restoration can probably be completed within the next 15 to 20 years. Of the eventual increase in grazing capacity, however, a part will be shared by additional wildlife and the equivalent of 55,000 animal months will be subtracted for areas closed to domestic livestock for watershed protection. These estimates assume that there will be intensive range management. Achievement will fall short of this goal to the extent that range management falls short of the possibilities now known.

The accomplishment of range management, in addition to more research as set forth in another section of this report, will require the completion of a range survey, of management plans, and of range improvements, artificial reseeding, and additional administrative personnel, the amounts and costs of which are set forth in a later part of this section.

GRAZING-DISTRICT LANDS

On the grazing-district lands, in view of the larger area, the long years of neglect, and the bare beginning of administration, the range-management task and additional expenditures needed are much larger than for the national forests. Forage production has been reduced to less than 35 percent of the original capacity. It is estimated, based on best available information, that at the present time these lands are furnishing an inadequate forage supply for 21.9 million animal months of livestock annually, at the rate of 6.83 acres per animal month. The present capacity of the usable range area, if stocked on a basis to stop further depletion, provide watershed protection, and insure gradual rehabilitation, is estimated to be at the rate of 12 acres per animal month or approximately 12.4 million animal months per annum. This represents a reduction of 43 percent from present use. The capacity of the range to support this reduced number of livestock depends upon how nearly management is applied to the full extent of its possibilities. If management is not fully applied, and the broader public interest is to be protected, an additional reduction of range use will be required, of anywhere from 10 to 40 percent, depending upon the intensity of management.

The heavily damaged ranges, because of severe soil depletion and the extremely slow natural process of rebuilding, may not be restored to full capacity within the next two generations, even under the best management. It is estimated that the productive capacity of the

present range area as a whole should be restored sufficiently within 50 years to support adequately the equivalent of the present number of livestock, or at the rate of 6.8 acres per animal month. A portion of this increased capacity, however, will be required for game and for areas closed to grazing for watershed protection.

Other steps in range management in addition to reduction of the number of livestock to the present grazing capacity are necessary on each individual range unit. Systems of grazing to promote natural revegetation must be applied. Areas which cannot be made to revegetate naturally should be reseeded artificially. Improper seasonal use should be corrected. Critical watershed areas should be located and given special attention or be closed to grazing. Needs of wildlife must be critically analyzed and provided for. Rodents should be controlled where damage is excessive. Necessary research should be undertaken. Watering places and other essential improvements must be planned and constructed to facilitate use of the forage and the application of range management.

Obviously action to accomplish the adjustments in range use necessary properly to restore the range and use the land should not be too sudden or too drastic. The whole program should be worked out by a gradual and orderly process to avoid unnecessary sacrifice of present investments of dependent enterprises. The important thing is that a policy be adopted and a plan of action initiated which in due time will reach the desired objective. This necessitates a well planned, closely knit, aggressive, administration.

Because of the wide variation in conditions of topography, soil, slope, vegetation, rainfall, and dependent watershed values, even within relatively small areas, and in adjustments needed in land use, blanket rules and plans in management will not suffice. A separate prescription, in the form of a management plan based on the local situation must be prepared for each range of watershed unit. The first step after the initial temporary broad adjustments are made, therefore, should be an inventory of resources and conditions to establish an adequate factual basis. This should be followed by the preparation and application of definite range-management plans for handling each unit of range and thorough periodic inspection to assure accomplishments.

The investment necessary for management plans, development, and improvement of the range is discussed under a later heading.

INTEGRATION OF PUBLIC RANGE LANDS WITH AGRICULTURE

The development of a sound agricultural program for the West requires the integration of the national-forest and grazing-district lands with the related agricultural resources in a manner to promote the social and economic welfare of the dependent population. In many parts of the West the summer range on the national forests, the spring-fall and winter range on the grazing districts, privately owned range lands, and crop lands (especially that best suited to forage production), are complementary parts of a single agricultural structure. The aim in the administration of the public range should be to give preference to the farmer or livestock grower who needs public range to supplement his crop and range land. Another aim should be to encourage the building up and maintenance of economic

units—that is, home units capable of supporting a family on a reasonable standard of living—as against concentration of the use of the public range in the hands of a few.

Application of these principles has met with a fair degree of success in the administration of the national forests but several factors have hindered a more extensive development of home units. One of these has been the laissez-faire policy in land occupation and use, including the unregulated use of the open public domain, which has placed the small farm operator at a disadvantage in acquiring the necessary outside farm or range land with which to supplement national-forest range. A second factor has been the submarginal nature of a portion of the ranch units outside the national forests. Still another, in part growing out of the other two, has been the unstable nature of the occupancy and use of agricultural land in and adjacent to the national forests. Now that maladjustments in land ownership and use are beginning to receive attention and at least part of the public domain is to be regulated as grazing districts, it will be possible, especially since so much of the range land is still in public ownership, to begin to correct a bad situation. In such a program the public and privately owned range and forage croplands should be considered in full relationship to each other.

Certain adjustments can and should be made on the national forests and grazing districts on the basis of present knowledge and information. But the situation is too complicated to proceed on a cut-and-fit basis. What is needed is a reconsideration of the whole basic structure. The first step to such an approach is a comprehensive resource and economic survey to assemble the basic facts as to total resources available on all classes of land, to ascertain present condition, adaptability to different uses, interdependability of use, suitability to different kinds of ownership, quantity of range, and other agricultural land required for a minimum economic home unit and ultimate best ownership and use. Upon such a basis may then be built a program of land use and ownership adjustments which will aim in the end to attain the highest use of all the agricultural resources for the satisfactory support of homes and people. Administrative policies for public lands should be modified to fit into the whole pattern. Such a program will require a long period of adjustment, but the aim should be to develop the plan and set in motion the forces which will lead in the direction desired through regular economic processes.

Such a plan should not automatically contemplate the dissolution of the larger outfits. There are conditions where, in order to be economically successful, large capital investment and large scale operations are necessary and can best be handled as individual or cooperative enterprises. Such an economy, however, in order to be socially sound, must comprehend equal or greater stability in satisfactory maintenance of dependent populations than smaller-sized units, and must be equally efficient in the use of the resources.

Accomplishment of the objective of integrating the forage resources of a grazing district with dependent agricultural resources, as discussed in the preceding chapter, will require certain modifications and clarification in the Grazing Act. One clause which should be repealed gives owners who carry loans on their livestock prefer-

ence over others in the issuance of permits. This, in effect, promotes monopoly of the range regardless of how such perpetuation may adversely affect the interest of others. Another clause which should be clarified may be interpreted to give preference to existing property rights rather than to human needs in the distribution of public benefits. Certain other clauses are ambiguous and might be construed to grant to favorably situated stockmen indefeasible rights and privileges, either directly or indirectly, by making the Federal law subservient to State law.

GRAZING FEES AND PAYMENT TO THE STATES

The forage resources on public lands have a value for which the user should pay a fair fee. The method of range appraisals employed on the national forests is to relate the fee paid on public lands to the cost of owned or leased range in the locality, with offsets for disadvantages inherent in the public range. This appears to be fair and equitable and suitable to application on all public range lands.

At the present time 25 percent of the gross revenue collected for grazing livestock on national-forest ranges is paid to the States for distribution to the counties in which it was collected, to be used for road and school purposes. The Grazing Act provides that 50 percent of the revenue collected on grazing districts shall be repaid to the States. There appears to be no sound basis for this inconsistency.

These repayments are made to offset in a measure the income the States and local subdivisions might have collected through taxation had the land passed into private ownership. No attempt is made here to establish an equitable basis for the division of revenue from public range lands. To do so would require a study which is beyond the scope of this report; however, it does seem advisable to mention some of the related facts.

It is true that the local political subdivisions are deprived of some direct taxes when the land is kept out of private ownership and administered by the Federal Government. On the other hand, there are several and perhaps greater indirect benefits. It has been shown (154, pp. 1095 1124), for example, in connection with the national forests, that Federal ownership and management of these lands result in numerous benefits to the States, including (1) stability and permanency of local industries dependent upon the land; (2) the protection of watersheds, conservation of wildlife, and development of recreational resources; (3) substantial reduction in the outlay of States and counties for protection and development of the natural resources, for construction of roads and trails, and for the enforcement of State laws and county ordinances. In general Federal ownership and management is thus a form of Federal aid to the States. It is not wholly consistent, therefore, that States should share in an excessive degree in the direct revenue, at least during the period that the Federal Government is making large capital investments for improvements to make the land more fully productive.

INTERMINGLED LANDS AND ISOLATED TRACTS

Among the problems which seriously complicate the administration of public range is that of isolated tracts of alienated range lands interspersed in the larger bodies of Federal land.

NATIONAL FORESTS

Within the exterior boundaries of the national forests are approximately 10.5 million acres of intermingled lands, not less than 75 percent of which should be acquired through purchase or exchange.

Although there is authority for the exchange of public land for private land within the national-forest boundaries at the present time, this provision does not satisfactorily meet the situation. Exchange of lands will assist in some degree by making it possible to acquire strategic tracts of private land. In many instances however, it will only "rob Peter to pay Paul" because management and protection will merely be transferred from one area to another. Most of these lands will probably have to be acquired by the Government by purchase. Legislation is necessary to authorize this procedure.

GRAZING-DISTRICT LANDS

On grazing-district lands also administration is handicapped by a very large acreage of intermingled alienated land. The State-owned lands in this category either should be blocked up through exchange and administered by the State either directly or in cooperation with the Federal Government; or, if left as intermingled lands, management should be waived to the Federal Government and the proceeds, after deducting a reasonable amount for cost of administration, returned to the respective States.

Blocking up of privately owned lands through exchange, as provided for in the Grazing Act, will help to simplify administration but does not entirely solve the problem. Much of the intermingled, submarginal, privately owned lands should eventually be returned to public ownership if management for perpetuation of the resource is to result. Where the Government is an important owner, and pending the adoption of an acquisition program, private owners should be encouraged to waive management to the Federal Government and in exchange be entitled to graze livestock equivalent to the grazing capacity of the waived lands or to receive the fees collected by the Government from other users less a reasonable deduction for cost of administration.

A special ownership situation is found on ranges where water is normally scarce and most of the water holes are now controlled by isolated tracts in private ownership. Unless the isolated tracts are acquired by the Federal Government, management and administration of the grazing districts will be seriously interfered with, especially in view of the terms of the Grazing Act providing that owners of watering places shall be given preference in the use of the adjoining range to an extent necessary to use properly such owned or leased water. This clause may become an instrument for giving rights and

monopoly in the use of public range and thereby defeat the proper correlation of public range with other types of agricultural land. Public interest in public ranges requires that the Government own and control both the land and the water. The private equity in many of these watering places should be extinguished by Government purchase and the clause of the Grazing Act which grants adjunctive right of use to the owner or lessor of water should be repealed.

Another problem is presented by the isolated tracts of public land, of a few to several thousand acres in area, widely scattered throughout many of the more solid blocks of privately owned range land in the West, which cannot readily be administered as parts of grazing districts. The Grazing Act provides that such tracts not exceeding 760 acres may be sold at public auction. Legal subdivisions of public land not exceeding 160 acres unsuited to cultivation, may also be sold to owners of adjoining land whether or not such tract is isolated. The act also provides for the leasing of isolated tracts, if 640 acres or more in area, to owners of contiguous lands.

Federal lands within areas more or less of which will be acquired by the public should, of course, be retained in public ownership permanently. It would be unfortunate therefore, to dispose of any isolated tracts until it is known definitely what areas eventually will revert to the Federal Government or the States.

In range units where there is a moderate quantity of more or less isolated Federal land, say 15 to 40 percent, and conditions are favorable for private ownership of a large share of the range land, as in the Pumpkin Creek-Mizpah grazing district in Montana, discussed earlier in this report, the cooperative-association form of management may be successful. The management of the Federal Government on its land in such cases should prove an effective guide to obtaining good management on the privately owned land as well.

Where both the privately owned and public land is submarginal for private ownership another plan should be followed. West of the Great Plains region, for example, probably 53 per cent of the 167 million acres of untimbered privately owned range land is destined for public ownership. In such areas the isolated public tracts should be leased for terms of 1 to 10 years and, with proper restrictions as to use, until the ultimate form of ownership of the bulk of all the land has been determined.

Once a decision has been reached as to which isolated tracts should be disposed of, first consideration should be given to using such land as a base for Government exchange in acquiring alienated lands within the national forests or grazing districts. The final residue not usable for exchange may then be sold or leased, as provided for in the Grazing Act.

The whole situation is so complex and so far reaching in its implications that no sales or long-term leases of isolated tracts should be made until an intensive land classification has been completed that is designed to determine on a sound factual basis the best ultimate ownership of each tract. In order to lease small tracts pending the completion of a classification and adoption of the ultimate program, it will be necessary to amend the Grazing Act to authorize leasing of tracts less than 640 acres in area.

BOUNDARY ADJUSTMENTS

Certain adjustments are needed in the boundaries between the national forests and the present grazing districts as well as additions to national forests out of the unreserved public domain. These changes, for the present at least, involve only additions to national forests in order to include outside lands of national-forest character and to simplify administration. The lands which should be so added are shown in table 74. Three-fourths of this total is needed as winter game range to supplement summer game range now inside the national forest and thereby to round out yearlong game ranges.

Legislation is required to authorize transfer of land from the grazing districts or other Federal areas to the national forests in all States except South Dakota, Utah, and Nevada. Proper correlation in the administration of the national forests and grazing districts as subsequently discussed would doubtless make unnecessary the transfer of much of the land between the two classes of reservations.

In addition to the Federal land which should be included in the national forests, approximately 10 million acres of privately owned land now outside the national forests should be acquired to simplify administration and round out national-forest-management units. Of this, 4,443,000 acres is required for game range.

TABLE 74.—Federal land which should be added to national forests from grazing districts and unreserved public domain

State	Recom- mended to Com- mission on Public Domain, 1930 ¹	Addi- tional needed for wildlife manage- ment	Total public land to be added	Portions of total needed for wildlife manage- ment
	<i>1,000 acres</i>	<i>1,000 acres</i>	<i>1,000 acres</i>	<i>1,000 acres</i>
Arizona.....	2,756	568	3,324	844
California.....	2,439	820	3,259	1,219
Colorado.....	3,206	2,835	6,041	5,441
Idaho.....	2,151	77	2,228	808
Montana.....	905	41	946	69
Nevada.....	1,684	944	2,628	1,598
New Mexico.....	1,827	279	2,106	523
Oregon.....	584	689	1,273	1,273
South Dakota.....		11	11	11
Utah.....	2,249	635	2,884	1,733
Washington.....	89	69	158	158
Wyoming.....	1,127	450	1,577	515
Total.....	19,017	7,418	26,435	14,192

¹ A National Plan for American Forestry (154), pp. 644-647.

MACHINERY OF ADMINISTRATION

The national forests and the grazing districts have been established for the purpose of protecting public interests, which it is recognized will not be so protected under other forms of ownership or management. Many of the problems are technical, involving a knowledge of plant, animal, and soil sciences, agricultural economics, land-use adjustments, and, in particular, range management.

The situation calls for a decentralized administrative organization with undivided responsibility and authority to transact local business promptly. The personnel must be qualified by training and experience to handle business matters with the public and the user and to apply both the practical and the technical phases of range management in accordance with local conditions. This can best be done by a force of men in the employ of the Government.

These lands also have resources needed in the development of local communities. Each State in which the lands are located has a distinct interest in them. There is necessity, therefore, for local viewpoint to be represented in the regulation of the use of the resources to meet local needs. This voice of the local interests may best be expressed through the cooperation of local groups or associations and agencies with the Federal agencies, but the Federal Government must retain final decision on all matters pertaining to the public interest.

NATIONAL FORESTS

Of the two classes of land, the national forests, because of higher values involved, more complicated association of different resources, more difficult terrain, and greater variety of conditions and problems to be dealt with, require a more intensive and hence more expensive administration.

The cost of administration of grazing of domestic livestock on the 82,538,000 acres of used range on the national forests was at the rate of \$0.0089 per acre for the fiscal years 1932 to 1935. The cost for wildlife management on this area was \$0.0018 per acre, or a total for domestic livestock and wildlife of \$0.0107 per acre.

Because of the pressure of other work on the national forests, range administration is not receiving the attention it should have. The range and the vital interests of dependent communities are suffering because much of the administrative time required for orderly and well-coordinated range use is being unavoidably devoted to other duties. To meet this need the administrative force on the national forests should be augmented by 125 additional qualified men for range management, at an additional cost of \$0.006 per acre of used range, and an additional administrative personnel for wildlife management at a cost of \$0.0042, bringing the total cost for both livestock and wildlife administration up to \$0.0209 per acre.

The capital investment for improvements already installed on national-forest ranges, including range fences, corrals, stock driveways, water developments, buildings, and range surveys and management plans, exclusive of roads, is in the neighborhood of 5.8 million dollars, or about \$0.07 per acre. Table 75 shows the more important additional improvements, developments, and other investments required properly to utilize and improve the resources and a proposed annual expenditure for a 5-year period to install these improvements. The total proposed additional improvements would bring the total investment in used range up to \$0.2107 per acre.

This estimate does not include an item for structural erosion-control work. Work of this character is necessary only where restriction of grazing and artificial revegetation will not result in checking erosion within a reasonable time and is justified only where high

values are at stake. Examples in each of several States are shown in table 76.

TABLE 75.—Capital investments required and annual cost of proposed 5-year program on 82.5 million acres of available national-forest range

Project	Size of project	Total cost	Cost per acre ¹	Time to complete	Annual expenditures for first 5-year period
	<i>Acres</i>			<i>Years</i>	
Range surveys and management plans.....	² 56,800,000	\$512,000	³ \$0.0062	5	\$102,000
Artificial revegetation.....	780,000	2,730,000	⁴ .0331	20	136,000
Rodent control.....	8,000,000	640,000	.0078	5	128,000
	<i>Miles</i>				
Range fences.....	13,300	4,376,000	.0530	10	438,000
	<i>Number</i>				
Water developments.....	8,205	3,362,000	.0407	10	336,000
Investment in present improvements.....		5,768,000	.0699		
Total.....		17,388,000	.2107		1,140,000

¹ Cost per acre is the total cost prorated to the 82,538,109 acres of used range.
² This is total acres to be covered and includes nongrazed and privately owned land mixed with usable Federal range.
³ The cost for the 56.8 million acres actually to be covered is \$0.009 per acre.
⁴ Cost per acre actually to be covered is \$3.50.

TABLE 76.—Examples of areas needing structural erosion control on national forests

State	Type of erosion	Type of control	Area	Cost per acre	Total cost
			<i>Acres</i>		
Washington.....	Gully.....	Check dams.....	5,000	\$20	\$100,000
Oregon.....	do.....	Check dams and reseeding.....	10,000	15	150,000
California.....	Sheet and gully...	Check dams and revegetation...	2,000	25	50,000
Utah.....	do.....	Trench terraces and revegetation...	1,000	45	45,000
Arizona.....	do.....	Diversion and spreading.....	65,000	2.5	162,500
New Mexico.....	do.....	do.....	1,700	3	5,100

THE GRAZING DISTRICTS

The net usable Federal range land in the present grazing districts, unreserved public domain, and other unregulated areas, all of which should be put under control in grazing districts or added to the national forests, is 149,390,428 acres. To administer this land adequately with an independent agency, including correlated use of all the resources, necessary technical services, range inspections, clerical work, and land examinations, will cost approximately \$2,260,000 per annum, or \$0.0151 per acre. This estimate is based upon the experience of the Forest Service. The wildlife management program for this land will cost at least an additional \$150,000, or approximately \$0.001 per acre.

The capital investments needed properly to develop and improve the grazing-district land and a proposed annual expenditure for a 5-year period are shown in table 77. The eventual total investment, as shown, will amount to \$0.39 per acre, of which about 3½ million

dollars should be spent per annum during the next 5 years. In addition, some structural erosion-control work will be necessary, but data are not available at this time upon which to base a reliable estimate. Additional rodent-control work may be needed, depending upon the extent to which infestation may spread. The largest single item is an average of nearly \$0.31 per acre for the rehabilitation of depleted range areas, which should be restored both to control erosion and increase the forage supply.

TABLE 77.—Capital investment required and annual cost of proposed 5-year program for 149.4 million acres of available range on grazing-district land

Project	Size of project	Total cost	Cost per acre ¹	Time to complete	Annual expenditure for first 5 year period
	<i>Acres</i>			<i>Years</i>	
Range surveys and management plans.....	² 149,390,428	\$666,000	\$0.0045	5	\$133,000
Artificial revegetation.....	18,000,000	45,900,000	³ .3072	20	2,295,000
Rodent control.....	40,000,000	3,200,000	.0214	10	320,000
	<i>Miles</i>				
Range fences.....	16,900	4,861,000	.0325	10	486,000
	<i>Number</i>				
Water developments.....	6,050	3,022,000	.0202	10	302,000
Total investment.....		57,649,000	.3859		3,536,000

¹Cost per acre is the total cost prorated to the 149,390,428 acres of available range.
²This equals the total available range but includes some nongrazed and intermingled privately owned range in amounts about offsetting available range which does not need to be covered.
³ The cost for the 18,000,000 acres actually to be covered is \$2.55 per acre.

COSTS AND RETURNS

Present operating cost and returns from grazing domestic livestock on the national forests and grazing districts and the estimated amounts under the essential administrative measures here proposed are shown on an acreage basis in table 78. Capital expenditures for range improvements already constructed, partly from emergency and relief funds in recent years, are not included in the present annual costs. The carrying charges for maintenance and replacement of such improvements, however, are included. The cash income from grazing on the national forests is based upon the estimated present grazing capacity and that 50 years hence and the base or average rate of the present grazing fees. The income from the grazing districts is based upon the estimated present and future grazing capacities and an assumed grazing fee approximately two-thirds that of the base rate on the national forests. The cost of maintaining improvements and the replacement charge are determined from cost records for existing improvements on the national forests. These figures for maintenance and replacements do not include any charges for artificial revegetation, rodent control, or erosion-control work. Nor is there included any item for road or trail developments, nor Federal contributions to States and counties in lieu of taxes. Furthermore, the rate charged for grazing use may change and the estimated cost of the additional improvements needed may be affected by changes in labor rates and price of material. These data are pre-

sented to afford some idea, based on the information available, of what the cost and income from the public range enterprise may be.

TABLE 78.—*Present and estimated proposed annual costs and cash returns per acre from national-forest range and grazing-district lands*

Annual cost item and income	Present grazing capacity and development status		Grazing capacity 50 years hence with proposed improvements	
	National forest	Grazing district	National forest	Grazing district
Carrying charges on improvements:				
Maintenance.....	\$0. 0047	(1)	\$0. 0118	\$0. 0038
Replacement.....	. 0043	(1)	. 0107	. 0038
Cost of administration.....	. 0089	(1)	. 0149	. 0151
Total annual cost.....	. 0179		. 0374	. 0227
Income from grazing of domestic livestock.....	. 0235	\$0. 0099	. 0283	. 0176

¹ Management of grazing-district lands by the Federal Government has been started so recently that administration has not yet been fully developed and improvement cost data are not available.

The principal point in these cost and return data is that the Federal range lands are likely not to constitute a source of net direct cash income. In fact, unless the grazing fees are made higher as the necessary improvements are installed, the costs will be higher than the amount paid into the United States Treasury. It will involve an increase ultimately of approximately 30 percent above the present average base rate of 14.5 cents per head per month for cattle and 4.5 cents for sheep on the national forests, and of approximately 30 percent above the assumed rate of 9.6 cents a month for cattle and 3.0 cents for sheep on the grazing districts. There is justification for such increases because the improvements installed and bettered forage conditions on the public range will result in a direct benefit to the user for which it is only reasonable that he should pay.

Moreover the solvency of the Federal range enterprise cannot be calculated wholly in terms of direct net cash income from grazing alone. In addition to the grazing fees must be considered the income and other taxes which the forage resources, when converted into marketable meat and wool, will yield on a sustained basis to the Federal Government and the various political subdivisions. The public range will also help to sustain the taxable value of related lands. Even the benefits from the range resources are not to be measured only on the basis of direct income from fees or indirect returns through taxes, because this feed supply is a link in a chain of resources, which, if weakened either by depletion or denial of use, would adversely affect the entire economic structure of the West.

Regardless of whether or not grazing on Federal range lands is self-liquidating, there are certain other individual or intangible public benefits which justify Federal ownership, protection, and management. These lands constitute a part of the great hinterland whence flows the water supply upon which is based the civilization of the western United States. What the protection and favorable yield of this resource is worth is perhaps incalculable, but, as shown in an earlier chapter, it is certainly very large. More tangible values are derived from the business transactions incident to hunting, fish-

ing, and recreational use of the land, but even these do not begin to measure the benefits of the renewed health and the pleasure derived from the human enjoyment of these areas.

UNIFICATION OF RANGE ADMINISTRATION IN ONE DEPARTMENT

The Forest Service, which has jurisdiction over the national forests, is in the Department of Agriculture. The grazing division in charge of the grazing districts is in the Department of the Interior.

CORRELATION IN ADMINISTRATION

Since the national forests and the grazing districts are part of a single complex agricultural land pattern, and since both classes of land must be integrated with the same farm and ranch lands, close correlation and coordination is needed in range administration. Many livestock are dependent on the national forests for summer range and on grazing districts for winter range. The same holds true for big game in many localities. Shortage of spring range on national forests may be relieved by proper adjustments with grazing districts. Where national forests and grazing districts adjoin, range improvements and range administration should be so planned as to bring about the best and most efficient utilization of their combined public resources. Neither can be safely or properly considered as a unit to be developed and administered without regard to the other.

Proper correlation and coordination would also simplify the rounding out of administrative units in both the national forests and the grazing districts and facilitate the handling of intermingled private lands. It would lead to a sounder basis for determining grazing fees. It would result in more effective use of supervisory and technical services and information. Since the main work period on the two classes of land comes at different seasons of the year, present short-term personnel could be transferred from one to the other and thus be put on a more nearly full-time basis, resulting in attracting better qualified employees. Finally, correlation in the many different phases, assuming a thoroughly efficient administration, would eliminate duplication of expenditures and result in lower cost of administration and more efficient service to the public.

Unification of administration in one department is the best answer to the correlation problem. Further advantages in unification are fairly obvious. It should eliminate any tendency for two agencies to work at cross purposes on a common problem dealing with much the same people in much the same territory. It would obviate the necessity of a range user having to deal with one Department for the summer grazing of his livestock and with another for winter grazing and having to adapt his operation to two sets of rules and regulations.

WHY THE FOREST SERVICE IS IN THE DEPARTMENT OF AGRICULTURE

The Forest Service was transferred from the Department of the Interior to the Department of Agriculture by act of Congress, February 1, 1905. This action followed a recommendation of President

Theodore Roosevelt, who, in a message to Congress on December 6, 1904, declared:

All the forest work of the Government should be concentrated in the Department of Agriculture, where the larger part of that work is already done, where practically all the trained foresters of the Government are employed, where chiefly in Washington there is comprehensive first-class knowledge of the problems of the reserves acquired on the ground, where all problems relating to growth from the soil are already gathered, and where all the sciences auxiliary to forestry are at hand for prompt and effective cooperation. * * *

Since 1911, however, there have been repeated efforts to transfer administration of the national forests back to the Department of the Interior. No less than a dozen bills have been introduced into Congress to this end or to transfer the national forests to a new Department of Conservation. The most recent of these—H. R. 7712 and S. 2655 pending before the Seventy-fourth Congress—propose to change the name Interior to "Conservation" and to pave the way for the transfer of national-forest administration to the newly named Department. With a public range administration agency in each department, it becomes a matter of deciding in which Department the work should be grouped.

In order to lead to a clear understanding of the problem and to a sound answer to this question it is necessary first to consider what the public forest and range lands really involve and whether or not there is any valid cause for abandoning the reasoning which led to the transfer of the Forest Service in 1905.

RELATION OF FEDERAL RANGE TO OTHER AGRICULTURAL RESOURCES

The national forests and grazing districts are not merely so much range land which the Government has to protect and rent to the public, as a landlord holds a farm or range which he is willing to let to some qualified user. The ranges, as clearly shown in an earlier section of this report, are an inseparable part of western agriculture. The public range resources, for the most part, merely supplement the crops or wild forage grown on other agricultural lands. The products of these lands enter into the regular channels of distribution along with the products of all other agricultural lands. In the West, also, crop growing is dependent upon irrigation. The character and quantity of water supply in turn depends upon the protection of the mountain watersheds—the sources of the stream flow—which are mostly within the national forests—and upon the protection against erosion on the grazing-district lands, problems intimately related to the use of the land. Most of the wood supply used on farms and ranches comes from the national forests. There is also an intimate relationship in wildlife conservation between public range lands and other agricultural lands. Altogether the protection and use of the resources of the public lands play a definite and decisive part in the whole agricultural economy of the West.

How forestry and pasture management are related to other forms of agriculture is demonstrated by the situation on other than public lands throughout the United States. More than 2.5 million farmers derive part of their cash income from woodlands and forests on their farms. As shown in figure 83, the acreage in forest and grazing land on farms is greater than the acreage of all other farm

crops. Further, the forest and grazing land on farms far exceeds the total area of national forests, grazing districts, unreserved public domain, and other Federal range land in the continental United States combined.

The public forest and range lands, in view of the intimate relation with all the other problems in agriculture, are inseparable from other lands in developing a national agricultural program. The need for such a program has grown greater and greater, as pointed out by Secretary Henry A. Wallace, who declared:

Ever since the end of the World War, agriculture has been groping for a way to adjust production to demand, a way to promote sound land use and

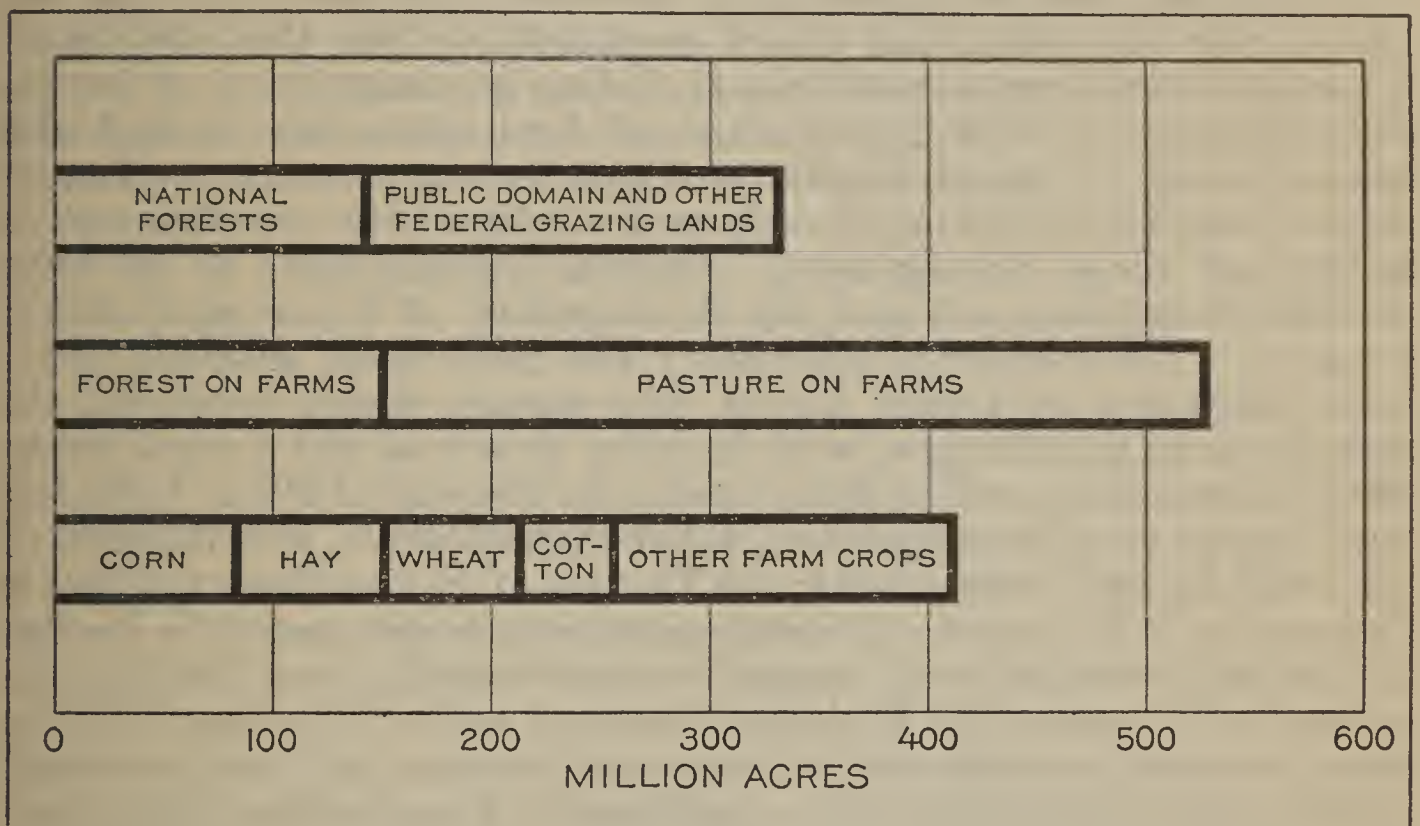


FIGURE 83.—FORESTS AND GRAZING INSEPARABLE FROM AGRICULTURE OVER IMMENSE AREAS.

Forests and pasture on farms occupy half again as much area as the national forests and other Federal range lands combined, and take up much more farm acreage than corn, hay, wheat, cotton, and all other crops.

discourage land misuse, and a way to build a satisfying rural civilization which might serve as the greatest single stabilizing factor in modern democracy.

The Federal Government has a definite obligation to help agriculture develop a sound program. The Department of Agriculture has embarked upon such a program as one of its major undertakings. Whatever is done must deal with adjustments in land for farming, grazing, forestry, and wildlife. It will involve public land as well as privately owned farm, forest, or range land. In the West especially, public lands, in a large measure, are the very key to the needed adjustments.

FOREST AND RANGE LAND MANAGEMENT A FUNCTION OF AGRICULTURE

The management of range and forest lands is purely and simply a function of agriculture. It deals with soil, interrelations of soil and water, with plants and animals, with diseases and insect pests of plants and animals, with the planting, growing, and harvesting of crops—in fact with all the “problems relating to growth from the

soil." It must rest upon the sciences and biological laws which have to do with the soil, water, plants, and animals. It involves economic and social problems of the farmer. Conservation of the soil and watershed protection are based upon the maintenance of biological balances of plant and animal life within their environment. Research in biological phases is needed in all these related fields. Management of the public land must be supplemented by these specialized biological or agricultural technics if the job is to be done adequately.

FUNCTIONS OF THE DEPARTMENT OF AGRICULTURE

The Department of Agriculture as now constituted contains the Forest Service, which has direct responsibility for the solution of forest and forest-range problems, including administration of the national forests. In the Department of Agriculture are located also most of the governmental agencies which have to do with the fundamental activities relating directly and vitally to the development of forest and range management. Various bureaus have to do with production adjustments and the development of better agricultural land use. The Bureau of Chemistry and Soils deals with soil problems, chemistry of forage plants, and certain forest products; the Soil Conservation Service, with farming practices and control methods to conserve the soil on farm lands; the Bureau of Plant Industry, with forage crop investigations, plant identification, and diseases of trees and range forage plants; the Bureau of Entomology and Plant Quarantine, with forest and forage plant insects and pests; the Bureau of Animal Industry, with range livestock breeding and feeding and control of diseases; the Biological Survey, with the conservation of game birds and animals and the control of rodents and predatory animals on forest and range lands; the Bureau of Agricultural Engineering, with snow surveys and other related problems; the Weather Bureau, with climatological observations and weather forecasting which relate to forest and range management and fire protection; the Bureau of Agricultural Economics, with land use and production studies; the Office of Experiment Stations, with State forest and range research programs; and the Extension Service, with educational work and demonstrations for farmers and livestock growers in range management and farm forestry.

The field of forest and range management is dependent on all these lines of work in addition to the special silvical, biological, economic, and industrial research peculiar to its own field. The administration of forest and range land must have freely available to it and must freely use the services of the kind afforded by these related agencies or reduce the value of its services or increase its costs, or both.

The Department of Agriculture is the duly constituted and authorized agency of the Government to deal with the agriculturist. The livestock grower and farmer recognize it as their agency and are accustomed to dealing with it.

All of the agencies of the Department work in close cooperation with the State agricultural colleges, agricultural experiment stations, and State extension services in range and forestry, as well as in all other phases of agriculture. The activities of all of these agencies

must be closely integrated in the development and carrying out of any program of forest and range management in relation to agriculture.

FUNCTIONS OF THE DEPARTMENT OF THE INTERIOR

The Department of the Interior, as now constituted, contains the Grazing Division which has direct responsibility for the administration of the grazing districts. The work of the other agencies of this Department is much less closely related to the management of forest and range-land resources than is the work of most of the agencies of the Department of Agriculture. The General Land Office keeps the records of the ownership status of lands, administers the laws with regard to the disposal of public lands, and surveys the lands as a means of identification, and keeps records thereof; also, at present, it handles clerical work for the Division of Grazing. The Bureau of Indian Affairs looks after the conservation of timber and range resources on Indian lands incidental to the promotion of the welfare of the Indians. The Geological Survey makes geological explorations, classifies lands for other than agricultural purposes, gages streams, and prepares topographic maps. The National Park Service manages, protects, and develops areas of outstanding scenic beauty and other unique characteristics for exclusive use as national parks and monuments. The Division of Investigation makes examinations to insure compliance of existing laws administered by the Department of Interior and for other purposes.

The Bureau of Reclamation constructs dams, canals, and power plants for irrigation, many of them on the public lands. The Bureau of Mines deals with conservation in the extraction and conversion of fuels, ores, petroleum, and natural gas. The Petroleum Administrative Board is engaged in conservation in the extraction of petroleum and natural gas. The functions of these various bureaus, etc., although essential in the handling of the public lands, are only remotely if at all involved in the conservation and management of the resources of the soil in relation to the general agricultural problems of the Nation. These conservation functions of the Department of Interior—except that dealing with plant and animal life on national parks and Indian reservations which is incidental to the special purposes for which these reservations are set up—deal with the engineering, legal, and clerical phases of land administration and with the chemical, physical, and engineering aspects of conservation of the mineral or inorganic resources in extraction and conversion, and have very little directly to do with the growing of plants and animals.

DEPARTMENT OF AGRICULTURE BEST FITTED TO ADMINISTER FEDERAL FOREST AND RANGE LANDS

A basic principle of good organization in government is the grouping of related activities into combinations that will provide the most efficient, systematic, and coordinated application of the available effort to the duties to be performed. It should meet the fundamental test of being able to provide the means of attaining the established objectives. The objectives in the administration of the national forests and grazing districts are conservation and the inte-

gration of the soil, water, plant, and animal resources with other agricultural resources in the development of a program of agriculture for the Nation. Such a synthesis must rest firmly upon the specialized agricultural technique and close contact and cooperation with the agriculturist.

Conservation pervades practically every activity of the Department of Agriculture which has to do with land use or growth from the soil. Conservation of all natural resources is, however, such a broad social aim that it will not serve as a basis for logical functional segregation. To associate the forest and range resources with the mineral resources in another department would separate closely related functions in agriculture and still would not group all conservation activities in one department.

To place forest and range work in a department other than the Department of Agriculture would result in the diffusion of effort in the development of the national program for agriculture; in divorcing the national forests and grazing districts from the closely related technical activities of the other agencies; in placing forest and range work in a department with fundamentally different technics and substituting cumbersome interdepartmental action for the smooth running, informal, and expeditious procedure which now exists between the Forest Service and other Bureaus of the Department of Agriculture. It would result also in the farmer having to deal with one department on certain forest and range matters and with another department on all other agricultural matters; or else in maintaining a forestry and range agency in the Department of Agriculture.

The accompanying chart (fig. 84) shows graphically the several agencies of the two departments in relation to the federally owned public forest and range lands. The heavy or "trunk" lines radiating from the "hub" in this chart indicate the agencies in these two departments which perform technical services in conservation which are intimately related to the activities connected with the public forests and ranges. The light or secondary lines indicate the more purely clerical or less directly related functions. A far greater number of activities would have to be handled interdepartmentally if the Forest Service and Grazing Division were contained in the Department of the Interior.

The best division of functions between the two departments is on the basis of organic and inorganic resources. The organic or "renewable" resources are those which have to do with growth from the soil, with plant and animal life, and the interrelationships of soil, plants, and water. These are the resources of national forests and the grazing districts, and logically their administration should be in the Department of Agriculture. The inorganic or nonrenewable resources are the minerals, coal, petroleum, or subsurface products of the land. They largely require a different type of chemistry, engineering, and conservation in use to prevent waste and destruction and logically belong in the Department of Interior.

The national forests and grazing districts belong in the Department of Agriculture where the resources of these lands may be integrated with the agricultural resources of other lands; where the technical services pertaining to them are located; where the agencies are with which the farmer and stockman deal on all other problems

relating to farm and crop; where cooperation with the agricultural colleges is now centered; where it will be possible for one committee in Congress to handle all appropriations and other legislative matters relating to agriculture.

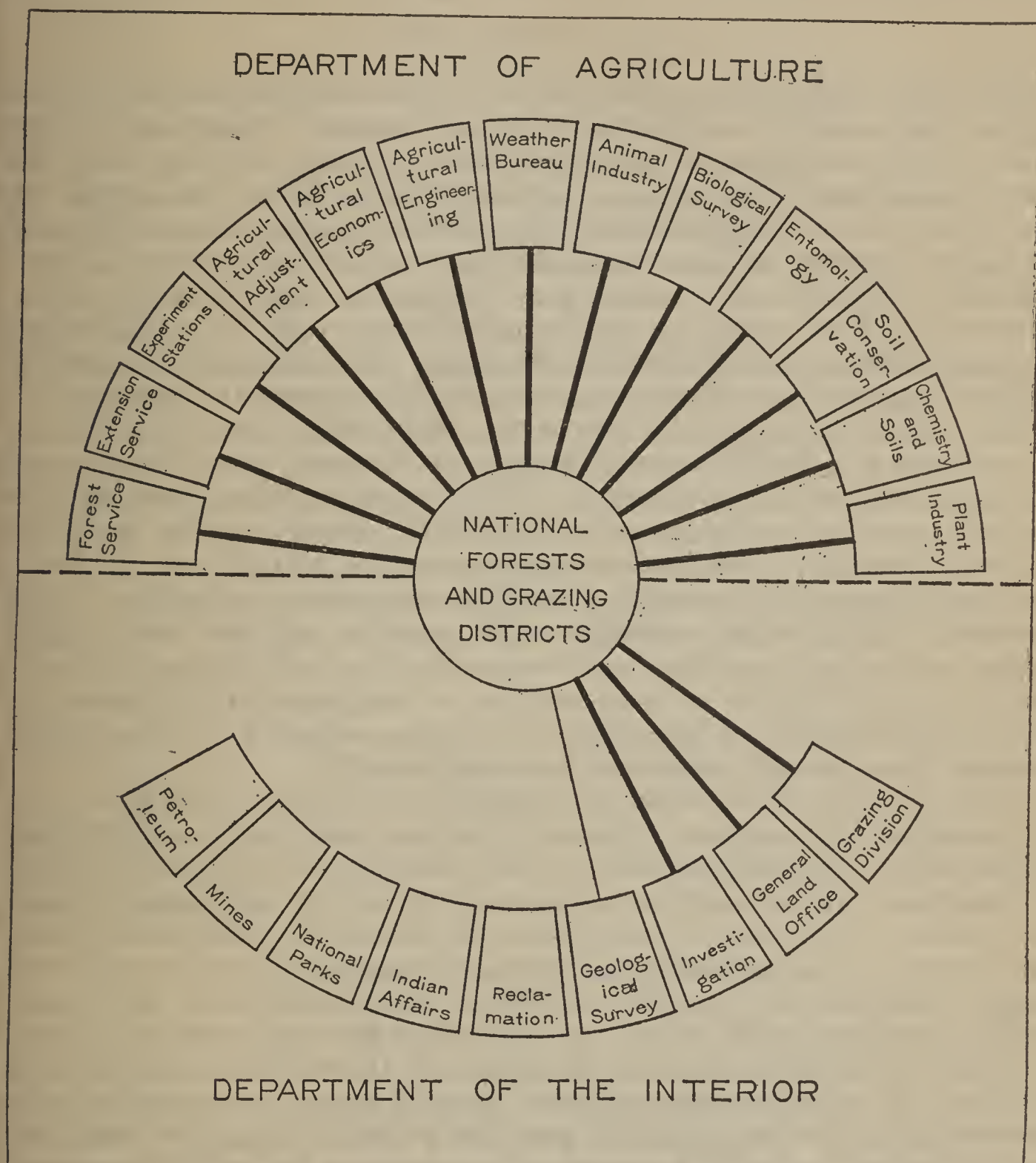


FIGURE 84.—THE DEPARTMENTS OF AGRICULTURE AND INTERIOR AND FOREST AND RANGE CONSERVATION.

Many bureaus of the Department of Agriculture are vitally and directly concerned with the biological problems confronting forest and range conservation. On the other hand, but few agencies of the Department of the Interior are so concerned.

PROGRAM FOR INDIAN RANGE LAND

Any sound program for the administration of Indian range lands must comprehend the ultimate integration of the Indian into the social and economic life of the Nation. When this has been accomplished there will be no further need for special guardianship of Indian rights nor for special care of Indian property as a separate ownership class. Meanwhile the administration of an Indian-owned natural resource should aim first toward the maximum sustained

contribution to the progress of the Indian people, and, secondly, the conservation of a resource which is of a magnitude to be of national importance. Sustained-yield management of the range resources will accomplish both these objectives.

RANGE CONSERVATION

In range conservation the feature which overshadows all others is the limitation of use to the sustained annual production of the land. The estimates of sustained-yield grazing capacity and the recommendations for current stocking which follow are based on the present knowledge and conditions of forage types and degree of depletion together with all available information as to past and present use. Further range surveys and research, together with a consistent record of actual use, will undoubtedly result in modification of present estimates of desirable stocking; but sufficient information is now available to indicate what broad adjustments are required.

The present grazing capacity of the 48.4 million acres ⁴⁴ of Indian range land is 5,923,000 animal-months per annum, or at the rate of 8.2 acres for each animal-month. At the present time, however, the range is stocked to the extent of 8,049,000 animal-months, or at the rate of about 6.0 acres for each animal-month. To bring use down to present grazing capacity, therefore, requires a reduction of 26 percent. The grazing capacity which may be attained under good range management within approximately the next 50 years is estimated to be 9,080,000 animal-months, or a stocking of 5.3 acres to the animal-month. This estimated future capacity is 53 percent greater than present estimated grazing capacity.

Except in the Southwest, substantially the present range use, on the average, can continue. Some of the reservations are overstocked while others are understocked. The necessary reductions on some of the reservations may be compensated for by increased use on the others. Improved distribution of livestock, additional water development, the application of grazing systems and other improved range-management practices, the better consolidation of land ownership contemplated under the Wheeler-Howard Act, the continuance of rodent-control measures, and the further reduction in number of worthless range horses should result in a gradual improvement of the ranges, make possible a small increase in livestock, and compensate for all necessary increased use for wildlife, recreation, or other purposes. Any internal adjustments which may be required in the allocation of grazing use can be made gradually and with no serious inconvenience to the Indian livestock industry or present permittees.

In Arizona and New Mexico a very material reduction in livestock numbers is urgently needed at an early date. Every reservation in the two States with the exception of one in New Mexico and a small one in Arizona is more or less seriously overstocked. Appropriate reductions on six of the other reservations can be made without affecting Indian-owned livestock, since white-owned stock constitutes a material part of the overburden on these reservations.

⁴⁴ Includes a small percentage of nongrazing land in small scattered tracts within the main bodies of range land.

The 20 million acres of range land on the remaining 10 reservations within the two States are grazed yearlong and exclusively by Indian livestock. On some areas, to promote rapid recovery, about three-fourths of the stock may have to be removed and generally the ranges cannot be expected to carry over one-half of the present livestock.

The alleviation of this situation on these reservations constitutes the most serious and complex range problem on Indian lands. The sheep, the land, and the Indians are faced with ruin unless the overgrazing is stopped and the range rehabilitated; but what to do in the meantime for the Indians who are largely dependent upon their livestock industry presents a real difficulty.

The net progress toward permanently reducing the numbers of stock on the range as yet has been comparatively slight. Under the mandate of the conservation features of the Wheeler-Howard Act the stocking must be reduced to the estimated grazing capacity of the ranges. This should be accomplished at any early date in order to prevent further damage to the forage resources and as a prerequisite to success in the efforts toward erosion control.

Reduction of livestock, although absolutely essential for the conservation of the range and hence for the permanent welfare of the Indians, does not solve the present economic problem for the Indians. A more equitable distribution of livestock and grazing privileges offers a partial solution; but additional land for the Indians, the development of supplementary industries, or a combination of both will also be required.

The reduction of livestock to the grazing capacity of the range is so imperative as to overshadow the needs for the practice of other phases of range management. Until the overload on the Indian ranges of the Southwest is reduced, management will accomplish but little. However, the best possible range management should be practiced in order to keep the reduction to a minimum.

MACHINERY OF RANGE ADMINISTRATION

The forestry branch of the Indian Service has major responsibility for the management of Indian forest and range lands, the expenses for which are about \$200,000 per year, exclusive of the costs of timber sale and special work, and of clerical and similar overhead services handled in common with other activities. A program of adequate administration calls for an increase of \$290,000, making a total of \$490,000 per year, which would make an annual average cost of approximately 1.1 cents per acre or 0.6 cent increase over present expenditures, exclusive of clerical work.

MULTIPLE USE

In addition to the regulation of use of forest and range lands for timber and livestock production, the public policy and Indian welfare demands that attention be given to multiple-use management to achieve watershed protection and wildlife conservation.

Protection of watersheds is of local interest in maintaining favorable conditions of stream flow for irrigation control of floods and

in maintaining a favorable environment for fish life on the Indian reservations. Watershed protection is also of national interest because many streams important to the West rise on or flow through Indian lands. It is estimated that on Indian lands 22 million acres are severely eroded and 20 million acres are materially eroded. Adequate wildlife management is of special importance on Indian lands because hunting and fishing can be made an important source of livelihood as well as recreation to the Indians. The additional administrative facilities for handling wildlife work, it is estimated will cost an extra \$0.001 per acre on the average.

RANGE IMPROVEMENTS

Much of the need for structural improvements on Indian lands has been completed. During the period July 1, 1933, to March 31, 1935, 3,469 miles of range fences, 2,444 spring and well developments, 1,987 reservoirs, and 107 corrals were constructed. In addition, over 50,000 check dams for erosion control were installed. However, much work still remains to be done. An estimate of the range improvements required to be constructed over a period of years on all reservations where cattle and horses are grazed is shown in table 79.

The estimated cost of capital investments does not include an item for control of soil erosion. A detailed study of control work needed on the more seriously eroding Indian lands of the Southwest has not been completed and consequently no estimate is offered at this time of the amount or probable cost of rehabilitation work of this kind that may be needed.

Since the capital investments proposed in table 79 are not equally chargeable against all Indian reservations, a prorated acreage figure is of value only for purposes of comparison. On this basis, the improvements, revegetation, surveys, and management plans proposed and the more intensive plan of administration recommended would call for an average capital investment of 18.5 cents per acre spread over a period of years. The annual maintenance cost when the improvements are complete will be about 1 cent per acre. There appears to be no question that this full amount will be required in order to meet the mandates of the Wheeler-Howard Act.

TABLE 79.—Capital investment required and annual cost of proposed 5-year program on 48.4 million acres of available range on Indian lands

Project	Size of project	Total cost	Cost per acre ¹	Time to complete	Proposed annual expenditures for 5-year period
	<i>Acres</i>			<i>Years</i>	
Range surveys and management plans.....	28, 500, 000	\$210, 000	\$0. 0074	5	\$42, 000
Artificial revegetation.....	1, 630, 000	4, 645, 000	² . 0960	20	232, 000
Rodent control.....	12, 000, 000	960, 000	. 0198	5	192, 000
	<i>Miles</i>				
Range fences.....	5, 000	1, 500, 000	. 0310	10	150, 000
	<i>Number</i>				
Water developments.....	3, 000	1, 500, 000	. 0310	10	150, 000
Total investment.....	-----	8, 815, 000	. 1822	-----	766, 000

¹ Cost per acre is total cost prorated to the 48,390,979 acres of available range.
² Cost is \$2.85 per acre actually treated.

NET RESULTS OF PROGRAM

Although the program of work and expenditures recommended for Indian lands is considerably larger than at present no other sound alternative seems possible. The future welfare of the American Indians is dependent upon a sound foundation of natural resources available in perpetuity. To the long neglect of this phase of Indian guardianship is chargeable much of the present sad plight of the Indians of the Southwest. To this neglect is chargeable also much of the cost that is needed properly to improve the resources. A good start has already been made on the Indian lands but, unless supplemented with the necessary additional work, the process of reconstructing and maintaining a suitable environment for the Indian will be too slow and will lead to greater economic difficulties.

STATE, COUNTY, AND MUNICIPAL RANGE LANDS

The 17 Western States own an aggregate of approximately 58.2 million acres of available range land within the range area as defined in this report. This land is the undisposed portion of the grants to the respective States by the Federal Government⁴⁵ together with lands which have been acquired by foreclosure of State loans and, in certain of the States, by reversion of tax-delinquent lands. In addition, counties and municipalities own an aggregate of not less than 7 million acres of available range land, most of which has been acquired through foreclosure on tax delinquency. These lands represent a considerable part of the western range resource. Up to the present the State and local public range has been administered with sale or lease as the chief objective—a policy which has failed to conserve the resources. It is estimated that the grazing capacity has been depleted approximately one-half from virgin condition and that about 28 million acres are severely eroded and an equal amount is materially eroded.

STATE LANDS

RESULTS OF PAST AND PRESENT POLICIES

As already pointed out in an earlier section of this report, lands were granted to the States for the benefit of schools and other institutions and are held in trust by the State governments. The organic legislation usually provided that, as the lands are disposed of, the proceeds must be safely invested as trust funds. Provision is made in many of the grants also that any loss to the fund through unwise investment by the State must be restored from the general taxes. In at least a number of States, lands must be put up for sale whenever an offer equal to the appraised value is made. This policy was adopted at a time when the general conception of public-land administration was one of disposal. There was little if any conception that the grant lands should be retained and administered from the standpoint of income from the sustained yield.

The grant lands which remain are little suited for private ownership at the price for which they may be purchased.⁴⁶ Where the pro-

⁴⁵ Texas retained all of its land when it was admitted to the Union.

⁴⁶ In some of the Western States the organic legislation stipulates a minimum price at which institutional grant lands may be sold. Lands having a value less than the minimum price have remained in State ownership.

visions of the grants and the present State constitution and State laws make it mandatory to offer the land for sale, the establishment of an effective management administration is discouraged if not prevented. But even in the States where the land agencies have greater latitude, little effort has been made to undertake management. In those States where tax-delinquent lands revert to the State or the State has foreclosed on mortgaged lands, the laws generally provide that the land must be disposed of by sale insofar as it is possible to satisfy the lien against the land.

One of the chief reasons for lack of effort to apply management or obtain changes in basic laws that would authorize really effective management of State range land has been the character of the administrative agencies. The land-disposal tradition early became established and the initiative to change it has been lacking.

In most of the States only a portion of the scattered sections specified in the land grants have been blocked up through lieu selections. The bulk of the lands now owned consists of scattered tracts so isolated from other State lands as to make management extremely difficult.

The urge to obtain maximum current income from the land has encouraged obtaining maximum rental from leased land and has discouraged expenditures for range conservation. This, in turn, together with the lack of security of tenure to the lessee, has encouraged him to overstock the land in order to derive returns commensurate with the price he has been required to pay.

The isolated character of the tracts, where the bulk of the adjoining land is unregulated public domain, has resulted in no income to the States from much of their land. Utah perhaps represents an extreme case. In that State only 130,000 acres out of a total ownership of over 2 million acres was leased during the period 1923 to 1932, and yielded an average annual income of only \$16,058 (150). The major portion of the land is scattered throughout what was formerly unregulated public domain (now being included in grazing districts) in isolated tracts of 640 acres, which stockmen used free of charge in common with the Federal land because the State was unable to extract a fee or prevent trespass. The State lands were thus depleted along with the open public domain.

In parts of Utah and the other States where, through rental of the isolated State lands, it was possible for stockmen to control large areas of surrounding public domain, the returns to the State for the land actually leased have been higher than normal because the control of open public domain enhanced the rental price of the State land. However, depletion of the range in the State properties has usually accompanied the high rental prices.

POLICIES DUE FOR A CHANGE

There are several reasons why a reconsideration of the policies for State range lands may be expected. The people of the West as a whole are coming to realize that further disposal is unsound and only adds to the unfavorable ownership situation. This view is encouraged by the action at last on the part of the Federal Government to refrain from further disposal and place at least a part of the remaining open public domain under regulation under the pro-

visions of the Grazing Act. This will also facilitate State action on isolated tracts of State land surrounded by unregulated public land. The wider practice of conservation on Federal lands undoubtedly would encourage action on State lands. Many of the beneficiary State institutions are beginning also to take an interest in sustained income from the land in place of high immediate returns and an uncertain future.

Just how far each State will be able to go, however, in the better administration of its lands and continue to derive an income for the beneficiary institution will depend upon the sustained productivity of the land and the economy of administration. As already shown for Federal lands, income from much of the public range cannot be expected to exceed the cost of administration and adequate range management. When this is the case the beneficiary institution must face the problem of how to obtain the funds to replace those at present being derived from the lease of land. The necessity of some alternative appears obvious because continuation of excessive rentals which result in further deterioration will eventuate in a permanent loss of income. Each State will need to study its individual problems carefully and decide upon the course which will result in the highest benefit to the public interest in the long run.

PROPOSED METHODS AND PRACTICES FOR ADMINISTRATION

There are several methods of administration which might be followed on State-range land. One possibility is to continue to lease the land with stipulations in the lease contracts as to degree of stocking, seasons of use, and other requirements as to proper management. Inspection and enforcement of terms of a contract under such a system where the land is scattered in thousands of small tracts, would be expensive and impracticable in most cases. This plan would hardly be applicable except in case of lessees who may be relied upon to use the range properly.

Another possibility, where isolated tracts of State land are surrounded by or adjacent to Federal range land under management, is to enter into cooperative agreement with the Federal agency to manage the State land along with the Federal land and pay the proceeds, after deduction of a reasonable cost for administration, to the State. Such an arrangement is already in effect for State lands in some of the national forests and offers real promise in parts of many States.

A third plan consists of the States blocking up their holdings into tracts of a sufficient size to warrant establishing an administrative agency. Such consolidation of State land, through exchange for Federal land, is authorized for State land within national forests and grazing districts where this plan is followed.

Perhaps no one of the three systems could be made general in any one State. It might be found the most feasible in particular States to handle some land under one system and some under another. The system to follow will depend upon what is most applicable under the particular circumstances.

One of the big tasks in the management of State range lands is reductions in the present use. The present grazing capacity is estimated, based on available information and comparison with similar

Federal lands, to be at the rate of 5.66 acres per animal-month of use. Present stocking, however, is nearer 2.8 acres per head. This shows the need for a reduction in present use of approximately 50 percent. The grazing capacity, say in 50 years, with improvement under good range management, it is estimated, will be at the rate of 3.3 acres per animal-month of use, or an increase of 70.6 percent over present estimated grazing capacity. The capacity figures, of course, will vary from place to place. The figure given is an average for all State lands.

Professional management.—The change to resource management will require a change in administrative set-up in most States. Basic legislation should be enacted declaring that permanent and constructive management shall be the guiding principle in administration of the land. There should be a close correlation between the land offices and the State agricultural agencies; or better, the administration should be placed under the agricultural agency. This is necessary in order to insure the application of sound professional management and to get away from the viewpoint of maximum revenue for the present where it results in impairment of the sustained productive capacity of the land.

Multiple use.—The principle of multiple-use management should be applied on State range lands in order to derive the fullest benefits from all the resources. Over 4 million acres of forest ranges is involved. Watershed protection and propagation of wildlife is a responsibility of the State on State lands. Where wildlife production and recreational use—on which there seldom is an excise charge—will reduce other income to the beneficiary institution, some means of reimbursement from the State game or general tax funds should be developed.

Integration with agriculture.—The State range lands should be coordinated with other agricultural resources in order to obtain the highest use from all the land, as is provided in Federal range-land administration.

Cost of administration and improvements.—Cost of administration and construction of improvements will vary with local conditions. It is estimated, based on experiences on the national forests, that, for all the Western States, the average cost for a proper qualified professional administration capable of applying the necessary technical range management will cost not less than \$0.0116 per acre for use by livestock. The necessary additional cost for wildlife administration should be paid out of State game funds.

The following average cost per acre for resource surveys, management plans, improvements, etc., is estimated to be needed:

Range surveys and management plans-----	\$0.0053
Range fences-----	.0480
Water development-----	.0133
Revegetation and restoration (acres actually treated)-----	3.05
Rodent control (acres actually treated)-----	.08

These charges would be necessary whether or not the lands are blocked, since if left in scattered tracts the States should pay a pro-rata share along with the other agencies whose lands share in the benefit from the improvements. As pointed out in a later section of this report, the States should also undertake a share in the research

problem necessary to solve many of the problems in range management.

Much of the county and municipal land is leased or rented and some of it is a no man's land open to free use. Practically all of it is badly depleted and becoming worse. The county ownership is being added to continually in those States where tax-delinquent lands finally revert to the counties. The appalling situation being created by tax delinquency on range and dry-farm lands has been discussed in an earlier section of this report.

The long time required in most States before governmental agencies finally take title to such lands makes it difficult to determine how large an acreage will eventually pass on to public ownership, but it is generally recognized to be large. One of the chief problems in this connection is to speed up the process whereby lands which have been abandoned and are definitely known to be unfit for private ownership will become public property. During the intervening period these areas are subject to all sorts of abuse. Shortening the period of recapture would reduce the extent of injury and shorten the time before rehabilitation could be started.

The extent to which there is a place for county or municipal ownership and management of range land unsuited to private ownership will depend upon circumstances in individual cases. The larger, stronger counties or cities may be able to undertake the work on a satisfactory scale. Others will probably not be able to set up properly qualified agencies to handle such properties adequately, at least on a permanent basis, and may decide to turn the land over to the State or the Federal Government in order that it may be managed by agencies better prepared to do the work, under such terms or reimbursement as are found proper. One important possibility for counties or municipalities deciding to regain range land is to enter into cooperative agreement with State or Federal agencies to administer the land along with other public land and share in the receipts. In some instances lessees doubtless can be found who will utilize the land under proper restrictions. Action will vary widely, depending upon particular circumstances, but definite provision should be made to prevent further deterioration and to restore the forage values.

LEGISLATION NEEDED

The proposed program for the several classes of public lands will require certain modifications of present legislation and some new legislation, both Federal and State. These needs are summarized in a later section.



